MACHINE TOOL Blue Book

JUNE 1941

A Verson PRESS—

BUILT for the Deep Drawing and Stamping Problems of Today!

HERE'S a straight side mechanical press of 215 tons capacity that is ideal for the tough production schedules of industry's increasing pace. It is a typical example of the efficiency in design found in all Verson products.

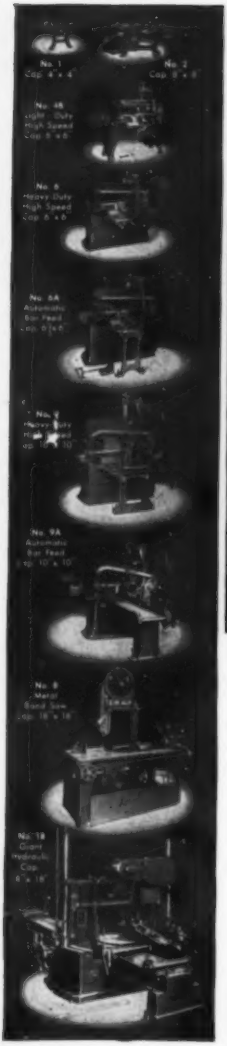
Versatility, increased punch and die life, exceptionally clean stampings are inherent features of Verson Presses for they are built by the pioneers of welded allsteel frames.

Whether the units you manufacture are large or small there is a Verson Press to do your job efficiently, quickly and at minimum cost.

Let a Verson engineer help you choose the press you need.

Power Presses • **Press Brakes**
Hydraulic Presses • **Clutches**
Forging Presses • **Die Cushions**

VERSON ALLSTEEL PRESS COMPANY
9303 S. Kenwood Avenue
CHICAGO • ILLINOIS



In constant service 48 hours per week at the Gould & Eberhardt plant, Irvington, N. J.

● Purchased by Gould & Eberhardt, Irvington, N. J., manufacturers of gear cutting machines and shapers, to speed up cutting off from bar stock on various grades of steel up to 6" in diameter, this MARVEL 6A high speed Production Saw has been operating 48 hours per week since installation over a year ago. When photographed it was automatically cutting identical lengths from "Maxwell" No. 3½ hot rolled natural steel 2⅝" diameter. The actual cutting time per piece, using a 6 tooth MARVEL High-Speed-Edge Hack Saw Blade, was 1 minute 15 seconds per piece.

MARVEL

ARMSTRONG BLUM MANUFACTURING CO.

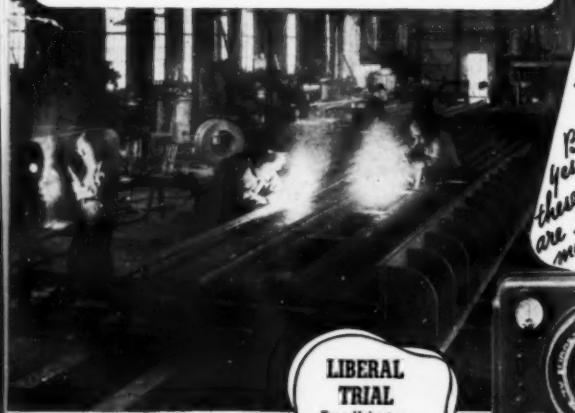
"The Hack Saw People"

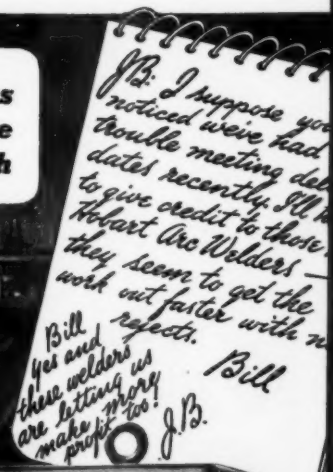
5700 Bloomingdale Ave., Chicago, U.S.A.

Eastern Warehouse & Sales: 199 Lafayette St., New York, N. Y.

We've Found a Way to Do Arc Welding BETTER, QUICKER and at lower cos

HOBART WELDERS have enabled us to meet delivery dates and save hundreds of dollars each month




Bill: I suppose you noticed we've had trouble meeting delivery dates recently. I'll have to give credit to those Hobart Arc Welders — they seem to get the work out faster with no rejects.
Bill
Yes and these welders are letting us make more profit too!
J.B.

LIBERAL TRIAL
Try a Hobart on your own work, at our risk, to prove it pays!

● This is no time to experiment with unknown quantities! Whether it's arc welders or turret lathes, you can only expect the best results from the best machine... and nothing less than the best is acceptable!

Hobart Arc Welders leave you nothing more to be desired, either in speed, quality of welds or in operating economy. And they'll deliver these same high quality welds day in and day out, guaranteeing the bigger profits that are rightfully yours. Check the coupon for details.

"One of the World's Largest Builders of Arc Welders"

GET YOUR ORDER IN NOW to Get Delivery

HOBART Simplified Arc Welders

HOBART ELECTRODES

They're the equal of or better than anything you've tried for tank, boiler, shipbuilding, pipe, machinery, construction welding, etc. Ask for handbook EW-68 and prices.

HOBART BROS. CO., Box TB-81, Troy, Ohio

Please send welding book and information on Hobart "Simplified" Arc Welders, especially on items checked:

I'm interested in _____ ampere capacity arc welders.

☐ Electric Drive ☐ Gasoline Drive ☐ "Build Your Own" Gear
☐ A. C. Welder ☐ Liberal Trial ☐ Hobart Electrodes
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NAME _____

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8 OPERATIONS—1 CHUCKING

Balanced design and superior operating features of Rivett 918 hand screw machine make it an efficient producer on small precision parts. Lever operated draw-in or push-out collets hold work. Spindle speeds, 150-3750 r.p.m. controlled by single lever. Automatic brake stops spindle.

WRITE FOR BULLETIN 918 FOR DETAILS.

RIVETT LATHE & GRINDER Inc.

BRIGHTON, BOSTON, MASS. U.S.A.

HARDINGE

Precision MILLING MACHINES *are Preferred*

BECAUSE OF PERFORMANCE

Day and night Hardinge High Speed Precision Milling Machines are meeting the definite demands for which they were designed.

Their performance is being proven NOW. The accuracy, ruggedness, and ease of operation make them preferred for exacting milling operations.

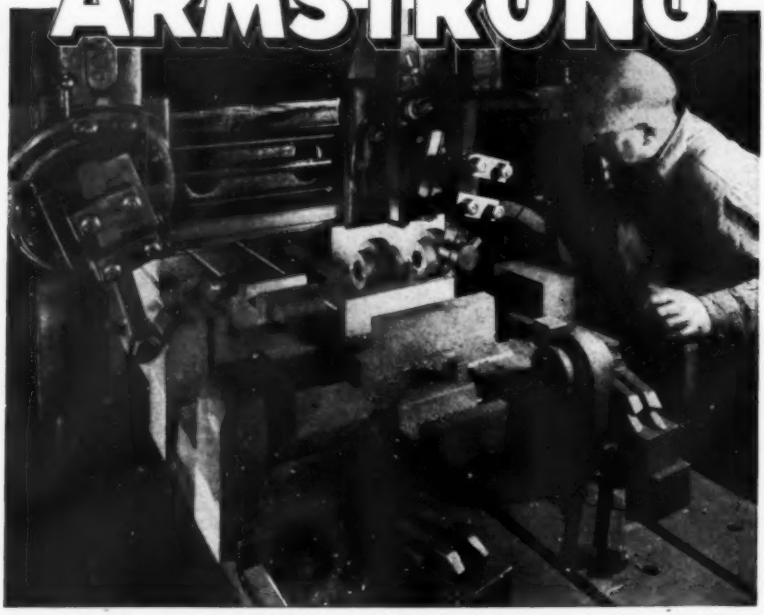
This machine, along with the other Hardinge Precision Machine Tools, is verifying the logic of using the proper size machine for the work.

HARDINGE BROTHERS, Inc.

ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

ARMSTRONG



ARMSTRONG PLANER TOOLS

Speed up any planing job!

With an ARMSTRONG Planer Tool for each planer head, you can start any planer job without waiting to "tool-up", for "tooling up" is reduced to selection of cutters, adjustment of cutter angle and clearance and tightening the set nut. These permanent, all-purpose tool holders take cutters quickly ground from standard high speed steel "squares" or "flats". They hold cutters at any angle . . . right or left . . . and at any clearance, always permitting the most efficient approach to the cut. They hold cutters ahead of center for extreme rigidity, or behind center when "gooseneck" tool is wanted, as for keyways or for heavy cuts on especially tough steel. Because of the extreme adjustability of these tools, it is often possible to complete jobs requiring top and side planing, under-cutting and, sectional interrupted cuts without moving work on the bed of the planer. It is the most efficient planer tool obtainable for all planer operations, except where extremely large areas are to be surfaced. For large surfaces, the ARMSTRONG Gang Planer Tool is recommended, for it will cut planing time as much as 60%.

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

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Eastern Warehouse & Sales: 199 Lafayette St., New York, N. Y.

ARMSTRONG TOOL HOLDERS Are Used in Over 95% of the Machine Shops and Tool Rooms

MACHINE TOOL BLUE BOOK

Hitchcock Publishing Co., 508 So. Dearborn St., Chicago

32,500 THIS ISSUE *JUNE 1941* *VOLUME 37, No. 6*

CCA

THIS MONTH

Removing Surface Defects by Superfinish *By E. L. Hemingway* 33
Machine Tools for Big Guns *By G. A. Spohn* 67
Production Engineering in the Defense Program *By M. L. Hutchens* .. 81
Standardizing Carbide Tools 99
Key Facts about Keys *By H. F. Williams* 103
Heat-Treatment, Wear-Resistance and Hard-Facing Data 223-5-7
Welding in Maintenance Work *By Francis A. Westbrook, M. E.* 137
Electrothermic-Permeation 149
Novel Dust Control 143
Featured In This Issue 29
Editor's Page 31
"Let's Talk Shop" 117
What's New in The Industry 155
Méchanics Through The Ages 237
Latest Equipment Catalogs 243-4
BLUE BOOK Buyers' Service 240
Index to Advertisers 289-291

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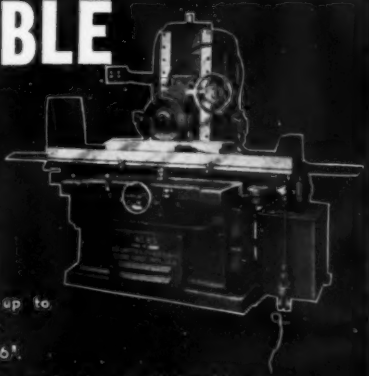
INDISPENSABLE *for* DEFENSE PRODUCTION



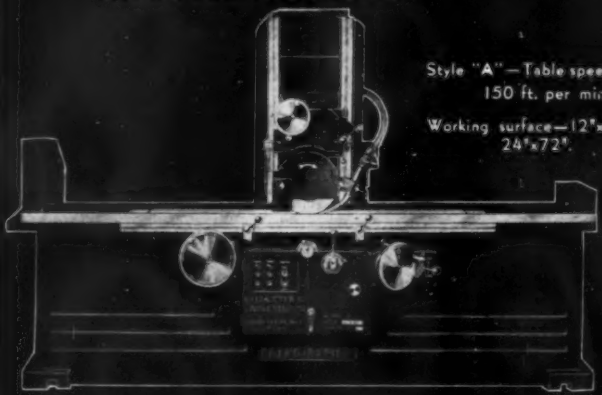
No. 55—Table speeds up to 125 ft. per min.

Working Surface—12"x36".

These Grand Rapids Grinders, and others, will enable you to meet the demands of the present Defense program.

They offer you new standards of grinding performance—new production economies and new facilities for improving your products.

Let us send you complete details on these and other GRAND RAPIDS GRINDERS



Style "A"—Table speeds up to 150 ft. per min.

Working surface—12"x36" to 24"x72".

GALLMEYER & LIVINGSTON CO.

405 STRAIGHT AVE., S. W. GRAND RAPIDS, MICH.

"PEACE *hath her victories no less renowned than war"*

LET JONES & LAMSON EQUIP YOU TO WIN BOTH

J&L

PROFIT PRODUCING MACHINE TOOLS

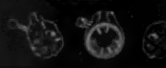
SPECIAL machinery built to manufacture defense orders can serve but one purpose. With the resumption of normal business it can only be scrapped or written off. On the other hand, Jones & Lamson standard equipment can handle a high proportion of your defense work to maximum advantage — *and still be available to earn peace-time profits in the years ahead.* That's why it pays to be familiar with all the possibilities of Jones & Lamson Fay Automatic Lathes, Universal Turret Lathes, Comparators, Automatic Thread Grinding Machines and Automatic Opening Die Heads. Before building or installing any machinery, put your production problems up to Jones & Lamson engineers.

RAM & SADDLE TYPE UNIVERSAL TURRET LATHES

FAY AUTOMATIC LATHES

OPTICAL COMPARATORS

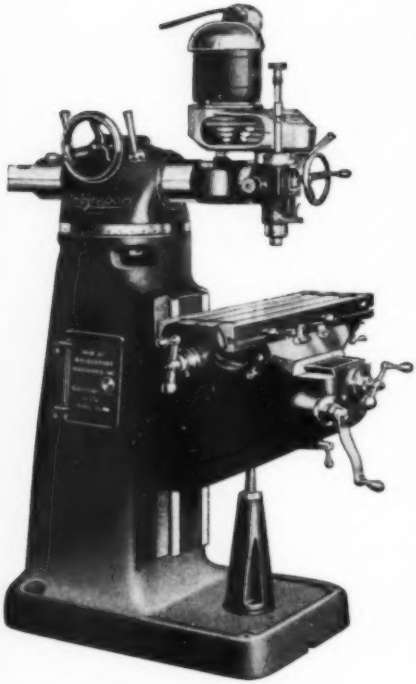
AUTOMATIC OPENING DIE HEADS



JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturers of Saddle & Ram Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Double-End Milling & Centering Machines . . . Automatic Thread Grinding Machines . . . Comparators . . . Tangent and Radial, Stationary and Revolving Dies and Chasers

A TRIPLE PURPOSE PRODUCTION MACHINE



Bridgeport Turret Milling Machine

For all Milling, Drilling and Boring, you will find the BRIDGEPORT Turret Milling Machine a valuable asset in your Defense production. Advanced modern features assure accuracy, speed and dependability. This machine is flexible and rigid, with unparalleled range and versatility.

Angular settings in one plane are achieved by turning the hand wheel which controls the keyed overarm. Turret diameter is 15" with 5" overarm.

Column, knee and table construction are rugged with wide ways and taper gibs for accurate and vibrationless operation. Table, knee and saddle locks are located in front for easy accessibility.

Graduated dials are 3¼" in diameter. Anti-friction bearings are used throughout.

For information, specifications and prices on this time and money saver, address all inquiries to

BRIDGEPORT MACHINES, INC.
52 REMER STREET • • BRIDGEPORT, CONN.

Take Advantage of Cut-off Wheels

. . . Their Speed and Economy on Metals and Non-Metals

ABRASIVE wheel cutting-off is the modern way of speeding up operations and lowering cutting-off costs. And Norton provides complete cut-off service — Resinoid, Rubber and Shellac bonds; Alundum and Crystolon abrasives.

Because Norton engineers have all three bonds and both types of abrasive to work with they can give unbiased assistance on all kinds of cutting-off jobs—metallic or non-metallic materials by dry, wet or submerged methods.

It will pay you to take advantage of Norton Cut-off Wheel Service.

NORTON COMPANY, WORCESTER, MASS.

W-812

NORTON ABRASIVES

You Get BETTER RESULTS

WITH . . .

Ettco-Emrick TAPPING ATTACHMENTS

BECAUSE

THEY HAVE A BETTER CLUTCH!

Sizes for No. 0 to 1" Taps

The results you get with a tapper depend primarily on its **clutch.** It must be positive in driving and at the same time, so sensitive that it lets go the instant the tap sticks or bottoms. Now that is an exact description of the clutch you get in Ettco-Emrick Tappers.

The exclusive Ettco-Emrick design provides exceptionally sensitive action while a specially treated leather that took years to develop, gives the clutch its positive driving qualities plus long wearing life. And here's another important advantage of Ettco-Emrick Tappers—when this material wears out—as eventually it must—the friction members can be replaced as a unit in just a few minutes!

WRITE FOR BULLETIN No. 2

It gives you the inside story of the clutch and the other features of design and construction which combine to make Ettco-Emrick Tappers the most efficient that money can buy. Write for your copy today.

And remember this—our 25 years of specialization in machine tapping are always at your service.

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596 Johnson Ave., Brooklyn, N.Y.
DETROIT • CHICAGO

The Famous Ettco-Emrick

DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

INSTALL

Low Cost

TORQ-QUA-MATIC TRANSMISSIONS IN 2 HRS.

LOW COST

LOW MAINTENANCE EXPENSE

INCREASED EFFICIENCY

GREATER FLEXIBILITY

HIGHER EMPLOYEE MORALE

TORQ-QUA-MATIC transmissions are powered by sturdy TORQ MOTORS. They are built to NEMA specifications, are completely ball-bearing, highly efficient and built to take punishment. Sizes ¾ to 15 H. P. Deliveries can be made from stock.

You can increase your production by as much as 25% in TWO HOURS. That's the installation time for TORQ-QUA-MATIC Transmissions—complete, ready to go. That is TRUE low installation cost.

When you consider:

- ★ **Your maintenance expense will be negligible,**
- ★ **Your production capacity will be increased,**
- ★ **That TORQ-QUA-MATIC flexibility saves time,**
- ★ **That operators will work faster with less fatigue—**

your request for specific costs and recommendations should be mailed RIGHT NOW!

Next Month: Why your maintenance expense will be negligible.

THE TORQ ELECTRIC MFG. COMPANY

★ **As defense production gains momentum, production managers and engineers appreciate the advantages of a source where equipment for top-speed production has been tested and proved—in advance of their needs.**

Wittek *Automatic* Roll Feeds provide an improved and simplified method of punch press operation that insures rapid feeding under all conditions. Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions.

Wittek *Adjustable* Reel Stands provide automatically expanding coil holders that center the coil and assure maximum production by eliminating looping, tangling and back lash of stock.

If your production problem involves feeding coiled stock to punch presses, it may be solved by consulting us. Your inquiry will be given immediate attention. Send for complete descriptive catalog.

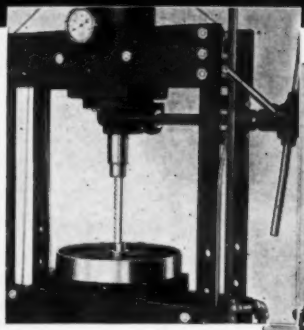
WITTEK MANUFACTURING CO.
4205 W. 24TH PL., CHICAGO, ILLINOIS, U. S. A.

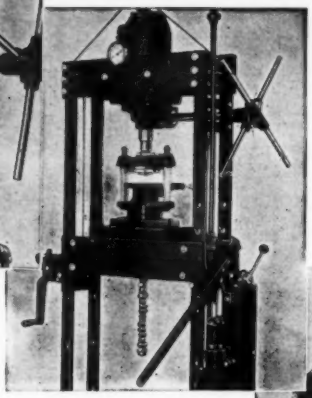
SINCE 1916

KRW

A MARK OF DEPENDABILITY

EVERY DAY FINDS NEW WAYS OF SAVING TIME AND LABOR WITH KRW HYDRAULIC PRESSES

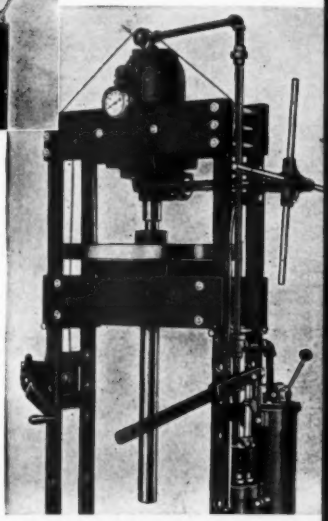




Left: Using a KRW Camshaft Timing Gear Fixture for replacing the timing gear on a Ford V-8 Camshaft. Special Fixtures such as this can be designed to give accuracy and speed to almost any operation, utilizing the KRW Press as the prime mover.

Below: Pressing "home" a long shaft in a flywheel. Bed can be adjusted to desired position quickly and easily.

Above: Broaching a key way in a flywheel on a 25 ton KRW Press. A ram travel of 7½ inches makes this and similar broaching operations possible on KRW Presses.



KRW Hydraulic Arbor Presses are doing innumerable jobs better and faster in every type of industry—replacing make-shift and sledge hammer methods. And there's a reason for this versatility—the many Exclusive KRW Features that contribute to SPEED and Convenience of Operation.

Send for your copy of the new 16-page bulletin describing in detail the NEW 2 Speed Pump—the Lever Controlled Valve that opens or closes with a flip of the Ball Arm—and many other patented features found only on KRW Presses.

Built in 25, 50 and 75 ton sizes. Prices start as low as $180.00* Compare before you buy.

** Prices F. O. B. Arcade, N. Y.*
Slightly higher west of Rockies.

K. R. WILSON

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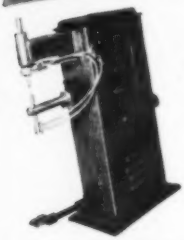
MAIL THIS COUPON

K.R. Wilson, 27 Lock St., Buffalo, N.Y.
Please send Hydraulic Arbor Press Bulletin No. 27.

Name .....
Address .....
City ..... *State* .....

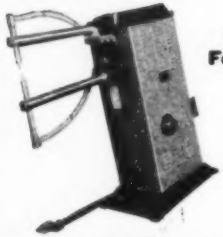
REX

Heavy Duty SPOT WELDERS

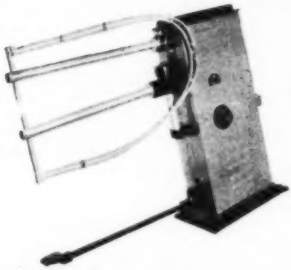


Press Type
Foot Operated

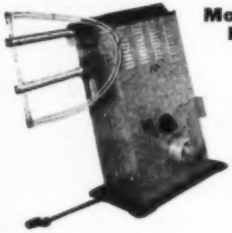
Rocker Arm
Air Operated



Rocker Arm
Foot Operated



Foot Operated
Swivel Lower Arm



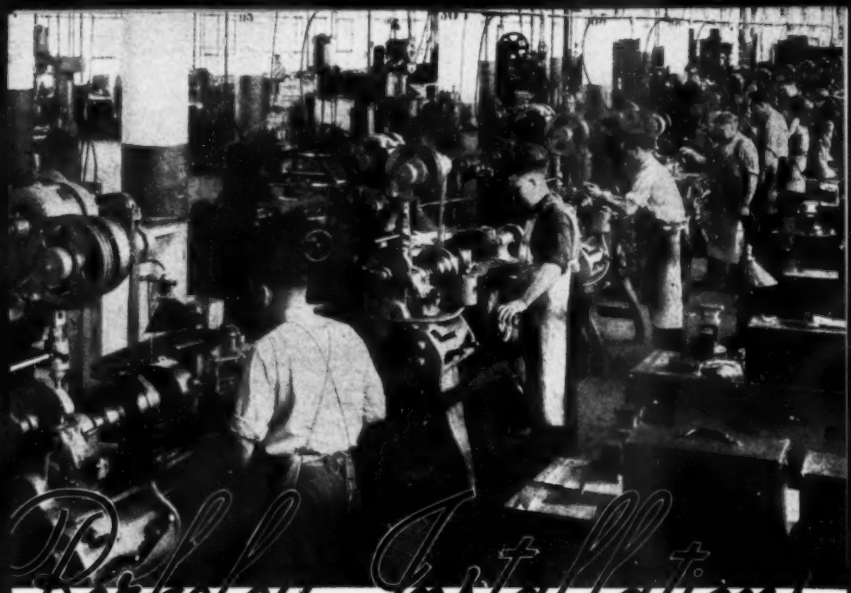
Motor Operated
Rocker Arm

PROMPT DELIVERY

Self contained Steel Cabinet units . . . Specially built and insulated heavy duty transformers . . . Stationary or adjustable or swivel lower horn . . . Swivel action foot pedal . . . Wiping action pass through switch . . . Silver to silver contacts, variable heavy duty heat control switch . . . Foot, motor or air operated, press or rocker arm types from 2½ to 100 K. V. A. . . . Bench models from 2½ to 7½ K. V. A.

Dyer WELDER AND ENGINEERING Company

7 East 19th Street, Kansas City, Mo.



Berkeley Installations

PROVE PROFITABLE

Berkeley Drives installed on your machine tools and machinery prove profitable in more ways than one. They are profitable because they eliminate the old fashioned overhead line shaft which is always a source of trouble and expense. They are profitable because all the power is utilized in having the drive directly mounted on the machine. They are profitable because they allow the grouping or placing of machinery to best facilitate production. They are profitable because the original cost is low and they save so much in time and expense that they soon pay for themselves.

Don't worry about not being able to equip your machines, because the All steel Welded bracket construction fits the drive to your particular machine. A different machine—a different bracket. Also, we have several different drives that will meet your drive requirements

We will be glad to answer all your drive questions.
Write today. No obligation.

THE BERKELEY EQUIPMENT CO.

CORRY - PENNSYLVANIA

There's A walker-turner "SPOT" IN YOUR PLANT!

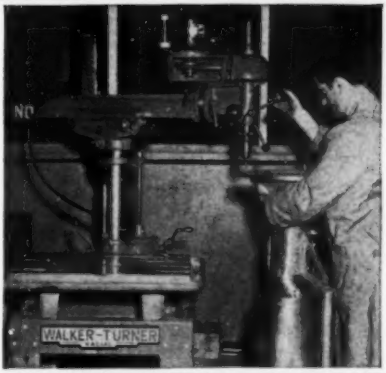
CHECK YOUR PRODUCTION KINKS . . .
WRITE US FOR HELP

In thousands of plants—large and small—these fast, accurate, dependable W-T machines are helping to speed up production of everything from battleships to women's compacts. A typical example is the Lionel Corporation, famous manufacturer of miniature railroads. These photographs show a few of the Walker-Turner "spots" in the plant of this progressive company.

It's a safe bet that there's at least one "spot" in *your* plant where *W-T machines can be used to greater advantage* than any other. It may be on the production line or in the maintenance shop; in the pattern shop or the shipping department.

Investigate that kink that doesn't look too important. It might show a *progressive* slowing up of operations—a loss of time and money. This is the "spot" where one of the many Walker-Turner machines could do a job. Better look it over and write us now. WALKER-TURNER CO., INC., 0000 Berckman Street, Plainfield, New Jersey.

Photographs courtesy of Lionel Corporation, Irvington, N. J.



walker-turner **WALKER-TURNER PRODUCTS**

DRILL PRESSES • LATHES • BAND SAWS • BENCH SAWS • TILTING ARBOR SAWS
JIG SAWS • RADIAL SAWS • RADIAL DRILLS • BELT AND DISC SURFACERS
GRINDERS • JOINTERS • SPINDLE SHAPERS • FLEXIBLE SHAFT MACHINES • MOTORS

UNCLE SAM WAS PUSHING THEM

—*I steered them straight*

Wanted SPEED at LOW-COST.

This manufacturer of naval and aircraft navigation instruments was getting behind the 8-ball on Defense production. Present tools were of universal electric type—slow in speed and in the repair shop too much of the time. I steered them straight along the following course:

(1) I tested their air pressure. It was too low for proper results if Air tools were added.

(2) I brought in a portable frequency converter and demonstrated a High-Cycle Grinder. Showed them how to make the sparks really fly!

Now—should it be Air or High-Cycle?

(3) Got out my pencil and did a little figuring. Twelve Air tools under their conditions would have required a compressor costing $2475. A generator set for twelve High-Cycle tools would cost only $1006. And power costs for High-Cycle would be ¼ as much as for Air.

Rotor High-Cycle 6-inch Heavy-Duty Sander.

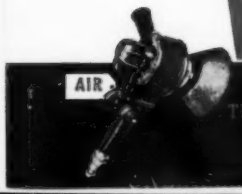
Power to spare. The High-Cycle saving of $1469 appealed to them. They bought six Rotor High-Cycle tools—straight and angle grinders and sanders. And on top of their saving, they had generator capacity enough to handle six more tools when needed.

Sound suggestions. I weigh all the facts before I make a recommendation. Then I suggest a plan that's tailored to fit your problems—to give you best results. I'm unbiased. I can recommend either Air or High-Cycle tools.

THE ROTOR ANALYST

Have you seen the new High-Cycle FACTS book? Gratis on request.

The Rotor Analyst has 65 different Air tools and 59 different High-Cycle tools with which to solve your problems.



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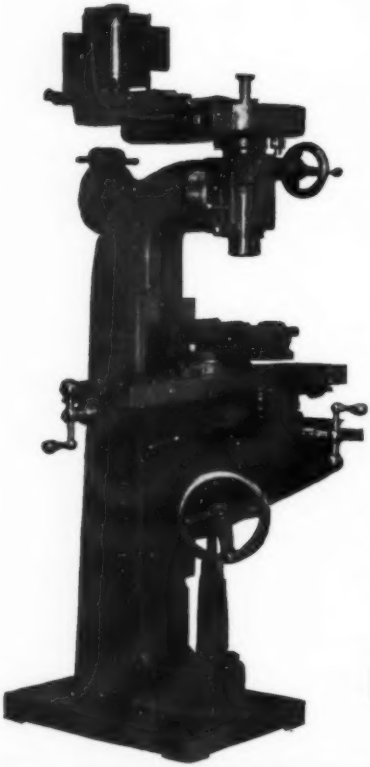

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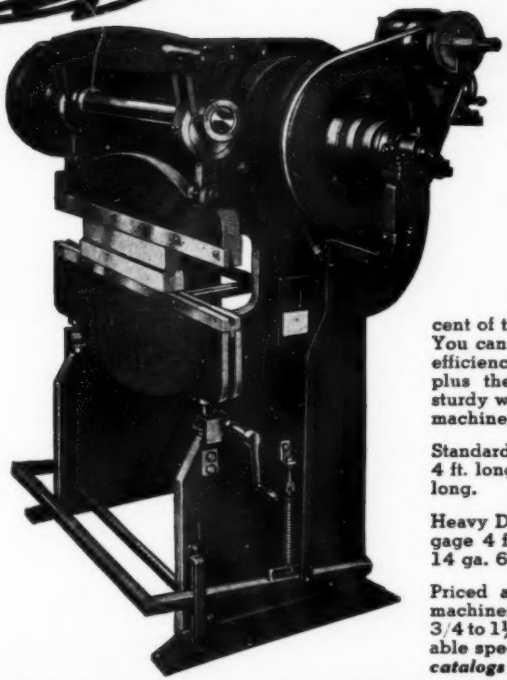

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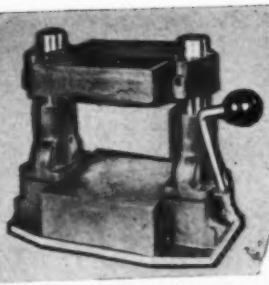

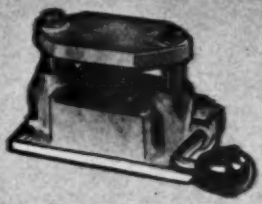

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Also the No. 9 Upright Saws.

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6 Spindle Drilling Unit

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Feeds are .003, 005, .007 and .010. Taper hole in spindle, No. 4 Morse.

Capacity with back gear is 1½" in cast iron. Without back gear, 1". Spindle travel with power feed is 9¼". Smallest distance between spindle and gib is 10½". Working surface of table is 24"x119". Maximum distance between spindle and table is 22". Vertical travel of table is 11". Distance between centers is 19". Total height with spindle up to 104". Height of base 10". Overall dimensions of base are 54" x135". Net weight is 12,000 lbs. *It will pay you to investigate this efficient, modern unit today.*

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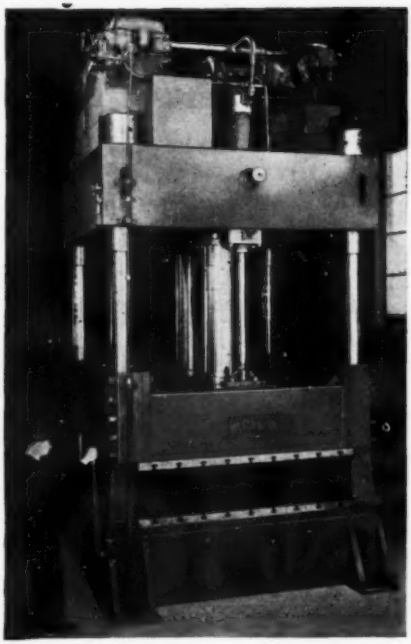

This new line of rugged BEATTY Presses offers capacities of from 300 to 700 tons. Within reasonable limits, the stroke, distance between columns and sizes of platens can be made to suit your requirements.

There are many advanced modern features such as the sturdy welded construction of base and top crown which are heavily reinforced for rigidity. Ram is also of welded construction, heavily ribbed and reinforced for rigidity.

For purposes of illustration, specifications are given for a typical 600-ton press. While the stroke is 49", the press is equipped with automatic stroke control on the up stroke and may be operated on a short stroke most suitable for the work to be performed, thus reducing the period required for advance to the work and return from the work.

GENERAL SPECIFICATIONS:			
Capacity in tons	600	Distance between columns, r. to l.	84"
Stroke	49"	Distance between columns, f. to b.	84"
Maximum opening, stroke up	60"	Platen size, r. to l.	108"
		Platen size, f. to b.	84"

Motor required for operating knock-out cylinder, 2 h. p., 1160 r. p. m. Either of two pumping units may be supplied for operating press. One of these uses a 30 h. p., 860 r. p. m. motor. The other uses a 60 h. p. motor and permits higher pressing speeds.

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giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs, the new TRU-GRIP Tap Holder—and also the full line of Procunier Universal Tapping Machines, hand, foot or air operated.

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Featured In This Issue

SUPERFINISH—In a popular discussion, E. L. Hemingway covers the nature and detrimental effects of surface defects, and their removal by Superfinish. He traces the development of efforts to attain finer finishes, as well as methods of obtaining and measuring them. Mr. Hemingway, Chief Metallurgist, Foster Machine Co., Division, The International Machine Tool Corp., Elkhart, Indiana, has been in charge of their Superfinish experimental and development work.

MACHINE TOOLS for BIG GUNS—Right now, most of us are interested in big guns, their construction and the equipment necessary to manufacture them. G. A. Spohn's article is especially enlightening and is based on material presented by him at the Westinghouse Motorization Forum. Mr. Spohn is Electrical Engineer, General Machinery Corporation.

PRODUCTION ENGINEERING in the Defense Program presents solutions of a few of the multitude of manufacturing problems involved in our armament efforts. The author, M. L. Hutchens, is a member of the Engineering Department of Kearney & Trecker Corporation, Milwaukee. The jobs are discussed in considerable detail and much of the information given may be adapted for other manufacturing operations.

STANDARDIZING CARBIDE TOOLS—After a long series of shop tests and experiments, the Federal Mogul Corporation has standardized on a new carbide tool program which promises important production economies. Tooling problems are simplified and the use of tungsten carbide tools is extended. An improved design of tool holder is shown and many of the program details are worthy of general adoption.

KEY FACTS ABOUT KEYS — This interesting contribution by H. F. Williams opens up some new ways of using keys, and tells some of the troubles likely to be encountered when keys are improperly used.

"LET'S TALK SHOP" — Under this comprehensive heading each month, you'll find helpful hints and kinks on a broad range of topics. This time, you'll find a lead-off article describing the construction of a home-made Welding Positioner Table designed by John S. Green of The Johnson & Jennings Co., Cleveland, O. Particularly useful for small jobs, the Table may be constructed with the facilities and parts available at most shops. Photo of the completed job was supplied through courtesy of Hobart Brothers Co., Troy, Ohio. Frank V. Faulhaber tells of several methods of detecting cracks in metal. Through courtesy of Lincoln Electric Co., Cleveland, photo is presented of sturdy welded parts of a flanging machine made by Blue Valley Machine & Mfg. Co., Kansas City, Mo.

WELDING in MAINTENANCE WORK—Frank A. Westbrook, M. E., has collected some interesting examples of railroad maintenance welding in the shops of an important Western road. The article is based on material submitted in the James F. Lincoln Arc Welding Foundation Program Awards. Some of the information is applicable to general industry.

NOVEL DUST CONTROL—Presenting an interesting new system of dust disposal.

ELECTROTHERMIC-PERMEATION is the designation of the operating principle of a new internally heated electric salt bath developed by the Upton Electric Furnace Co., of Detroit. Construction and operation are described and advantages listed.

HELPFUL DATA—On pages 223, 225 and 227 you'll find interesting information compiled by Irving B. Lueth on Heat Treatment Methods, Wear Resistant Materials and Hard Facings.

New!

South Bend Series "S" Tool Room Precision Lathe

16" x 6 South Bend Series "S" Underneath Belt Motor Driven Tool Room Precision Lathe.

THE NEW South Bend Series "S" Tool Room Precision Lathe has been designed and built for efficient service in the modern tool room. Standard equipment includes draw-in collet chuck attachment, micrometer carriage stop, thread dial, chip pan, collet rack, and telescopic taper attachment.

Spindle speeds range from 21 to 725 R.P.M. Quick change gear box makes all threads and feeds instantly available. Large diameter hand wheels, clear-cut easy reading graduations, and conveniently arranged controls reduce operator fatigue, and assure maximum production.

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TELESCOPIC TAPER ATTACHMENT

Turns and bores tapers up to 3½ inches per foot smoothly, easily, and accurately. Telescopic feature eliminates necessity of disconnecting cross feed screw when taper attachment is in use.

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WE FAVOR ADEQUATE PREPAREDNESS FOR NATIONAL DEFENSE

SOUTH BEND LATHE WORKS

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879 E. Madison St., South Bend, Ind., U.S.A.

Editor's Page

ANCIENT warriors had to carry their own armor. Now the armor must carry the men—in the air, over the ground, on and under the seas.

Modern battles are won by mobility, fire-power and tonnage of mechanical equipment, rather than by manpower. Our defenses must conform to this new pattern of warfare.

In a recent speech, Mr. Knudsen remarked that unless Hitler's indiscriminate bombing of civilians can be stopped, sooner or later we'll all have to live in holes in the ground.

Prevention of anything like that is the job ahead of all of us — and we're terribly late in getting started. That's why we must make a conscientious "all-out" effort now. We must all work harder and make any necessary sacrifices now — for future security.

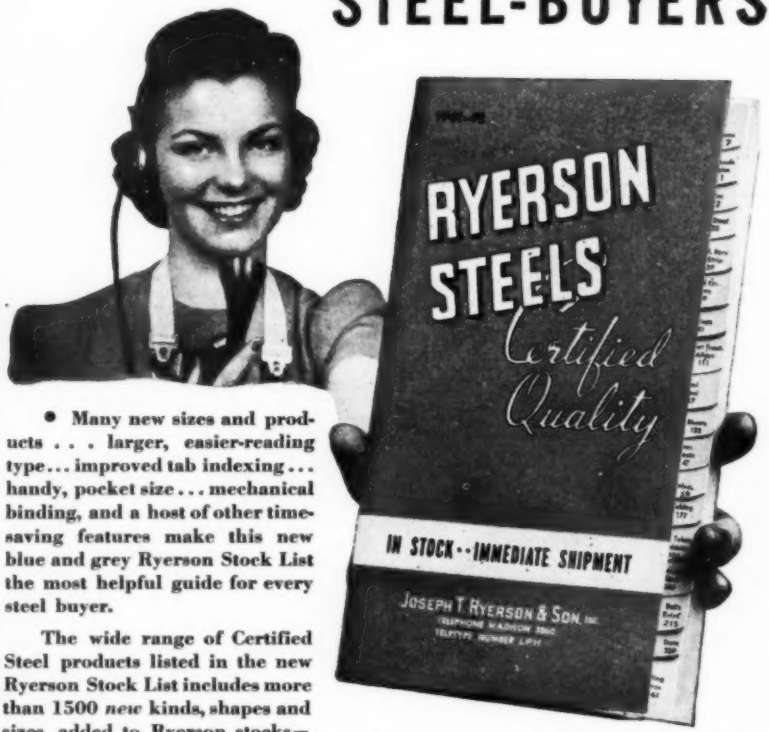
Already the tool builders have performed wonders — but they're pushing on to new production peaks. Industry generally is answering the call. Some plants could handle a larger share of defense work. Others are not yet participating.

Strikes and labor troubles have been a disquieting factor. In this period of peril, labor has been challenging our power to operate certain essential defense industries — industries that are vital in equipping our young men who have answered the call to arms.

Public sentiment can help correct this. An aroused citizenry will have slight patience with obstructors of the defense program—in the light of what happened to France. If we are unable to arm ourselves so thoroughly that the Nazis will not dare to attack our shores, there will be no profits to worry over—no social gains.

Wesley G. Paulson

New Guide for STEEL-BUYERS



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The wide range of Certified Steel products listed in the new Ryerson Stock List includes more than 1500 *new* kinds, shapes and sizes added to Ryerson stocks—many of them special analyses in demand for airplane construction and other exacting defense requirements.

Make this new Ryerson Stock List your guide to every steel requirement. If you have not received your copy, write the nearest Ryerson plant.

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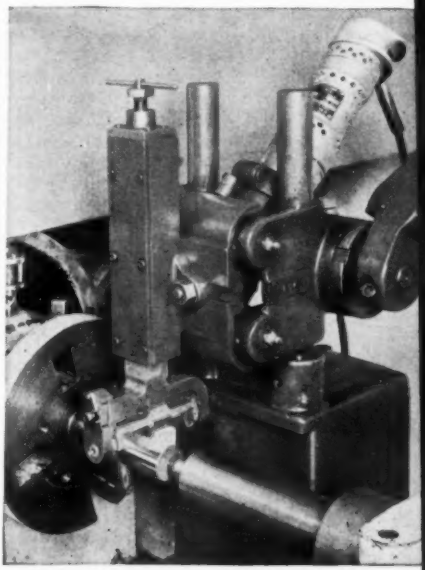
RYERSON *Certified* **STEELS**

Removing Surface Defects by SUPERFINISH

By E. L. HEMINGWAY

FOR a number of years, engineers have recognized an urgent need for improved bearing surfaces. One of the most desired conditions has been some means of avoiding the wearing-in period, with its creation of unpredictable clearance dimensions, and possible tendency to proceed to complete failure of the bearing. Yet the methods available for such improvement have been so slow and expensive, and in some respects so inadequate, that a more or less helpless feeling has existed regarding the situation. This attitude was further deepened by the fact that for a long while, no commercial means was available to measure the roughness of the surfaces in use, or any improvement in them that was attained. The result seemed to be that comparatively few engineers made any real attempt to find the specific nature of, or to remedy the deficiencies of, ground and otherwise finished surfaces produced for bearing purposes.

This condition continued until about six years ago, when through an unusual circumstance, both a practical means of measuring surface roughness, and a method of rapidly improving bearing smoothness and geometrical shape, were developed at almost the same time. During the intervening six years it seems that nearly every engineer in this country (and others as well) has become surface finish conscious, and has indicated an active interest in the improvement of his prod-



No. 1 Foster Superfinishing Attachment mounted on filler block on rear of engine lathe cross slide. The part (Stud shown in Fig. 3) rotates and the stone oscillates in a direction parallel with the axis of the part.

Fig. 2 — Brush Surface Analyzer in use, recording surface finish of a piston pin.

uct. Few developments in the mechanical field have attracted so much attention as these two advances.

The developments to which we have referred are the Profilometer for the measurement of, and the Superfinish process for the reduction of the surface roughness. More recently the Brush Surface Analyzer also has been marketed for measurement of surface irregularities, and has been another distinct contribution to the solution of these problems. Both instruments depend upon the creation of a minute electric current by the movement of a very finely pointed jewel over the inequalities. This current is larger when the displacement of the jewel by a rough surface is greater, and the instrument is calibrated to show the variations of current as a dimension, indicated in millionths of an inch or micro-inches.

In the use of the Profilometer, a meter indicates the running average of the roughness depth, read as the root-mean-square value. This figure must be multiplied by from three to five, depending upon the characteristics of the surface measured, to obtain the actual jewel or "tracer point" displacement. The Brush Analyzer draws an enlarged reproduction of the imperfections on a tape, with actual dimensions indicated. When using the Profilometer, any length of the same diameter can be checked quickly from the same set-up; but with the Brush, only ¼" length can be inspected from one set-up, which is made very quickly. It does not seem probable that the dimensional measurement made by either instrument is absolutely accurate, but both of them satisfactorily compare the quality of two or more surfaces of the same characteristics, in a strictly commercial length of time.

The Process

The purpose of Superfinishing is to refine the quality of surface produced by the usual dimension creating operations. Perhaps the most surprising feature of the process is its very simplicity. An inexpensive set - up for work on cylindrical parts is an attachment, which is usually mounted on the cross slide of an engine lathe. The part is rotated by exactly the same means used in turning; the essential difference lies in the tool used, and the method of its application. This tool is a square stick of bonded abrasive, the width of which is usually 60 to 75% of the part diameter. When the bearing length is no more than three times the abrasive or "stone" width, the stone is of about the same length, and the lathe traverse is not employed. If the bearing has a greater length, the traverse should be used. The abrasive stone is held against the bearing surface by the attachment under a spring pressure of five to 30 pounds per square inch. Instead of being held stationary in its holder like a lathe tool,

the stone is oscillated lengthwise, usually at a speed of 450 cycles per minute, and with an amplitude of 3/16". During the operation, the stone is flooded with a light lubricant to wash away abraded particles of metal and stone, and to control the cutting action of the abrasive. This lubricant is not at all for the purpose of heat removal, as the speeds and pressures employed are not high enough for the production of any consequential degree of temperature rise.

The importance of the oscillation of the abrasive should not be underestimated. The amplitude of this movement is sufficient so that several ridges of the previous finish will be passed over by each stroke. The direction of stock removal is thus from the side, and the ridges are much more easily removed. However, the motion is not so long but that it is rapidly reversed in direction, utilizing more angles of the grit points, and preventing accumulations of metallic particles on these points, to render them inefficient cutting tools, and to scratch the work. The ridged pattern of the usual surface finishes is due to a single direction of stock removal, and attention is called to the fact that, due to the oscillation, the path of a single grit is a sine curve. As the rotation of the part continues, these curves cross each other, forming a cross hatch. The result is a very smooth surface, of non-directional properties.

Improvement in Geometrical Shape

The stone used is somewhat softer than the wheels employed in grinding. As the operation proceeds, the abrasive slowly but continually wears to the average radius of the part, and here is the most unique, as well as the most valuable feature of Superfinish. This wearing-in of the stone face by the combination of rotation of the part, and endwise oscillation of the stone may better be described as a process of **generation** of its radius by the bearing surface, but without the reproduction of any of its defects, as the stone wears too slowly to be changed materially by any of the hundreds of individual irregularities.

During the Superfinishing operation, the high spots of any deviation from a perfect geometrical shape of the part's surface first come into contact with the generated stone face. This creates an area of high unit pressure, and the high spot is soon removed by abrasion. This process continues until all inequalities have been removed, and the surface has been improved to nearly geometrical perfection. It is true that

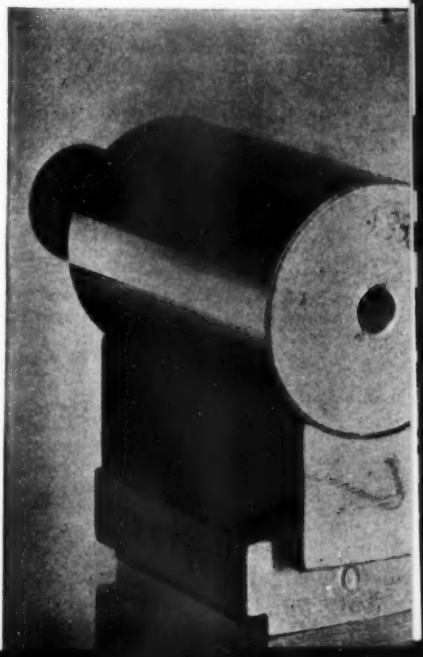


Fig. 3—A Superfinished stud and the stone with which the job was done, showing how the stone wears to conform to the average radius of the part Superfinishing setup is shown in Fig. 1.

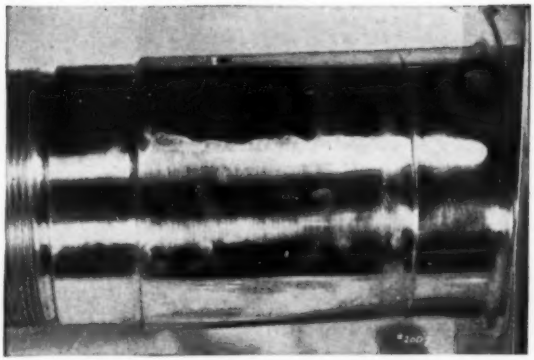


Fig. 4—Radial aviation engine main bearing, originally polished by sanding and then partially Superfinished. Observe last vestiges of hollow spots. While the sanded surface was smooth, the process had hollowed out large spots, making uniform thickness of oil film impossible, and metal-to-metal contact more probable. Superfinish removed many of the deficiencies.

Superfinish cannot completely compensate for the lack of careful workmanship in the prior operations. However, if the grinding has produced a size and shape which, even though it possesses numerous surface defects, averages a true cylinder, Superfinish will complete the transformation to very nearly perfection. When these conditions obtain, the stone is continuously and automatically dressed to the most desirable shape, and no other process is known where this sort of beneficial reaction between the tool and the work takes place.

Other Methods of Improvement

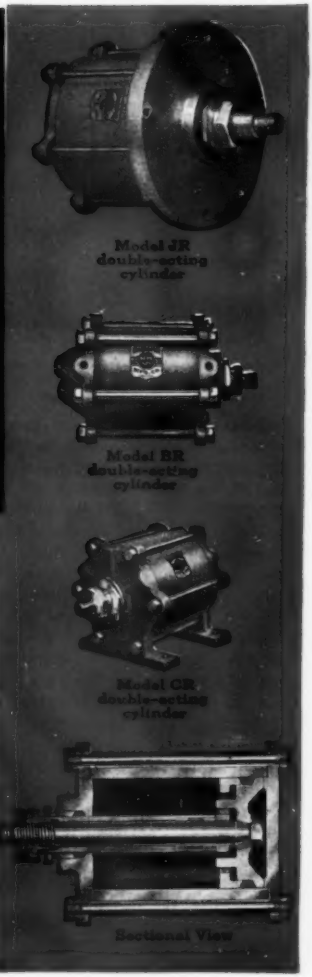
There are other methods of producing surface smoothness, such as lapping and sanding. Of these, lapping is satisfactory, both as regards smoothness and perfection in shape. However, it is almost invariably too slow and too expensive. Sanding is a more rapid method, which renders a surface smooth and pleasing to the eye. It even has a fair Profilometer reading. Nevertheless, the strip of emery cloth, employed as the abrasive, does not possess the rigidity and correctional capacity of the Superfinishing stone, and there is little tendency toward improvement in geometrical shape of the piece. Indeed, this condition is often made worse instead of better. A few seconds application of a Superfinishing stone, just long enough to mark the high spots, will show that formation of ridges and hollow spots is the result of sanding.

In comparing the Superfinishing process with any other employed for the same purpose, it should be emphasized that the Superfinishing tool has a **rigid area.** It is not a point contact, as in turning; nor is it a line contact, as in grinding. It is not a pliable strip of emery cloth, as in sanding. By its use, the removal of surface defects smaller than its face area is practically complete. The time consumed per bearing surface is usually under one minute, unless the length is such that traverse must be employed.

Grinding Defects

In turning our attention to the specific nature of the defects of the usual commercial finishes, and to their consequences upon bearing operation, we must be prepared to give consideration to the most minute surface characteristics. The possibility of decreasing harmful metal-to-metal contact depends upon our ability to produce accurate size and shape, without minute

16 in. x 7 ft. honed cylinder



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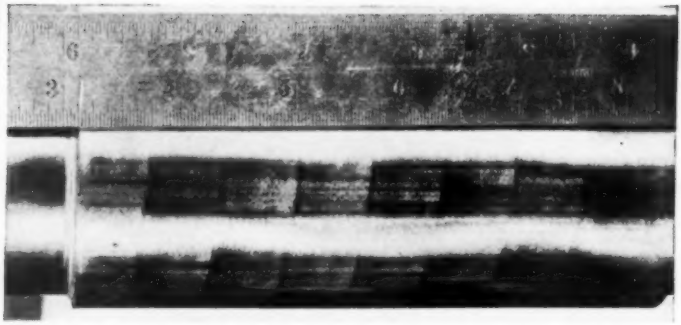

Fig. 5—Diesel locomotive shaft, Superfinished just long enough to start removing ridges and high spots. The spiral ridges, feed marks and grinder flats are plainly visible. Fragmentation and annealing are also present.

protuberances, which may seem small as compared to our usual standards, but very large as compared to the thickness of the most efficient oil film. To many, it may be a new idea that an oil film less than one one-hundred-thousandth of an inch in thickness provides as good lubrication as one of larger dimension, and that the load carrying capacity increases as the film thickness decreases. Nevertheless, many competent authorities report that such is the case, provided no high spots exist to cause metal to metal contact. While the time seems remote when bearings can be produced in a commercial way, with size and surface perfect to within the dimensions mentioned, there apparently can be no doubt that further improvement in bearing conditions is largely dependent upon our capacity to move toward that quality.

In investigating the deficiencies of the usual commercial finishes most often produced by grinding, it is found that they fall in one or more of the following classes:

1. Defects of surface roughness due to the action of the grinding grits, or the point of a turning tool, etc. These are usually in the form of spiral ridges.

2. The larger defects of longer pitch, due usually to machine tool inaccuracies. Examples are chatter marks, feed marks, grinder flats, and waviness due to wear of the machine bearings.

3. Metallurgical changes in the surface layer of metal, caused by the heat produced from the speed and pressure used in grinding. The average mechanic refers to this condition as burning or annealing.

4. The defective condition caused by the violence with which a tool, capable of producing size, removes material. The results have been termed "smear metal" and fragmentation.

A close analysis of these defective conditions will show that their production is due to several causes. Among them are:—A single direction of stock removal; a point, or line contact of the sizing tool; a dependence upon mechanical perfection in the machine tool for the perfection in the geometrical shape of the part; and the fact that the brutal action of a tool capable of removing a comparatively large amount of metal cannot also produce true smoothness, nor leave the metallurgical structure undisturbed.

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Fig. 6—Typical Superfinishing stones for many different kinds of jobs.

"Wearing-In" of Bearings

In investigating the harmful effects of Group I (the spiral ridges), they are found to be at least four in number. First, the peaks of the ridges only can be presented to the mating bearing surface. Because of their narrowness, the unit pressure on them is high, making it easy for them to penetrate through an oil film, causing metal to metal contact.

Second, after they have so penetrated, their peaks interlock with corresponding ones on the mating surface, and set up an abrading action, the end of which cannot be controlled. This action constitutes a large part of the process called "wearing-in." In the past it has been customary to fit bearings comparatively tight, depending upon a certain amount of this action to establish a satisfactory clearance. It seems reasonable to believe that a definite amount of clearance would result in the very best operating condition, but it does not seem logical to assume that we can depend upon the wearing-in of a bearing to a predetermined dimension, and still less that the wearing-in will cease at that point. It is hard to believe that reliance upon an abrading action between two surfaces in order to produce the correct amount of clearance between them, or their proper smoothness, can ever be considered a controllable one. It certainly would seem desirable to remove the surface defects before the assembly of the parts, with the dimensions such that the desired clearance is fixed before any operation of the machine. Actual, practical experience has shown many times, that when this is done, the wearing-in period is practically eliminated, and the worn-out condition is considerably delayed.

Kinds of Bearing Wear

It appears that damage to bearings occurs in a progressive sort of fashion with increase in the severity of the operating conditions. The extent of the damage will depend upon the following factors:—The quality of the lubrication, including its cleanliness; the maintenance of correct temperature; the amount of clearance; the affinity of the two metals for each other; the difference in the relative hardness of the metals; the load pressure; and last, but far from least important, the roughness and metallurgical condition of the surfaces. All of these have a bearing on the possibility of metal-to-metal contact, and on the consequences whenever it does exist. The least consequential results from such contact are the displacement of surface imperfections through interlocking with those on the mating surface. Here the high ridges are merely peened down, and nothing more serious than increased clearance is the result. Unfortunately, such a simple condition will seldom be the

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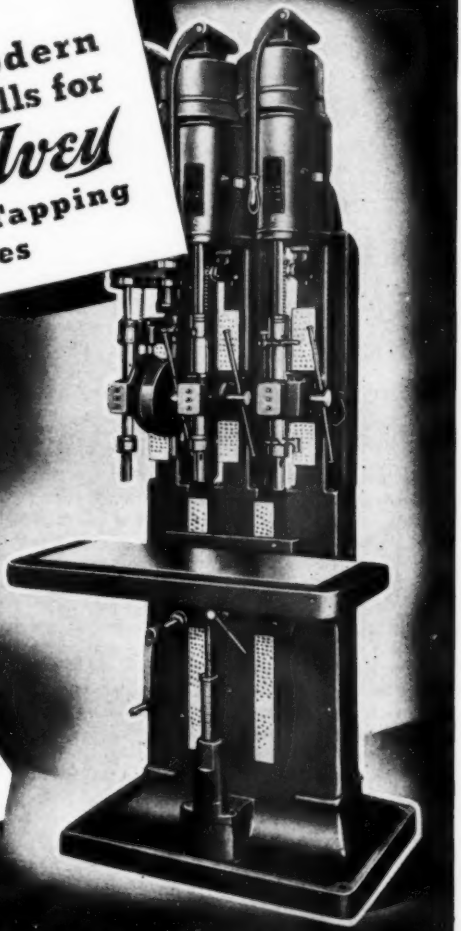

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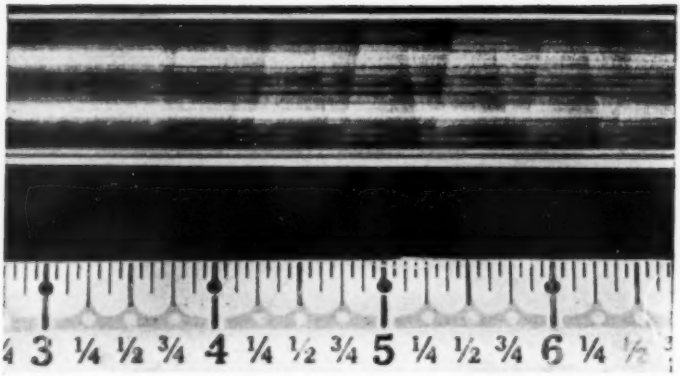

Fig. 7—Presenting some of the different varieties of surface roughness including spiral ridges, feed marks and chatter marks. Fragmentation and annealing are also indicated.

case. Almost invariably, some fragmented material will be freed to cause abrasive wear.

The consensus of opinion seems to be that abrasion, due to the presence of dirt and loosened minute chips of metal, either in the lubricant or embedded in the bearing surface, is responsible for the greater portion of bearing wear. Undoubtedly there are several sources of such abrasive particles, but with the possible exception of internal combustion motors, the most important origin is fragmented and abraded metal torn from the bearing surfaces themselves. Some of these are washed out of the bearing by the flow of lubricant, scratching and wearing as they do so; others are forced by metallic pressure into the face of the softer of the two metals. This surface then acts as a lap to wear down the harder of them, and is the reason for the apparently inconsistent fact that a softer bearing metal often outwears one much harder. Practically complete removal of the sources of these metallic particles is quickly accomplished by Superfinishing.

Under somewhat more severe operating conditions, particularly heavier loading and rougher surfaces, a second type of wear often described as "cutting wear" begins to take place. Here as before, fragmented metal is completely loosened, with much the same effect. In addition, the ridges and high spots of the harder metal act as dull tools to gouge out the surface of the softer to depths often including metal previously sound. While rubbing action will eventually wear such surfaces to a semblance of smoothness, no predetermination of the clearance dimension thus created is possible. It does not seem probable that satisfactory operating conditions can ever be secured through such a process.

As the conditions become still more severe, another action is encountered, the effects of which are the most damaging of all. The average mechanic refers to them as "galling." This action is believed to be due to a welding which takes place between the two bearing metals. It seems that three conditions are necessary for a weld to occur. The surfaces must approach each

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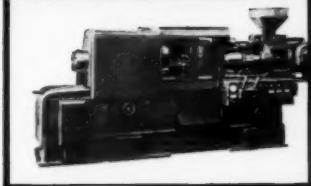

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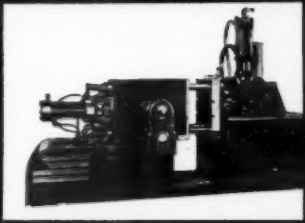

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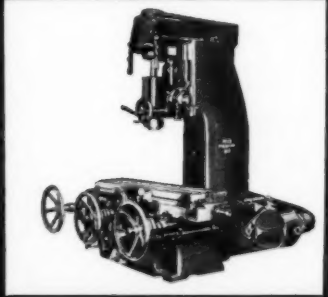

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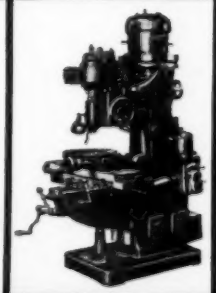

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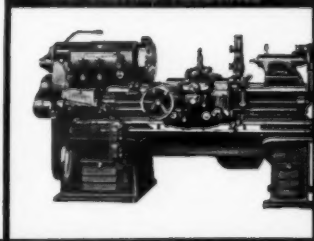

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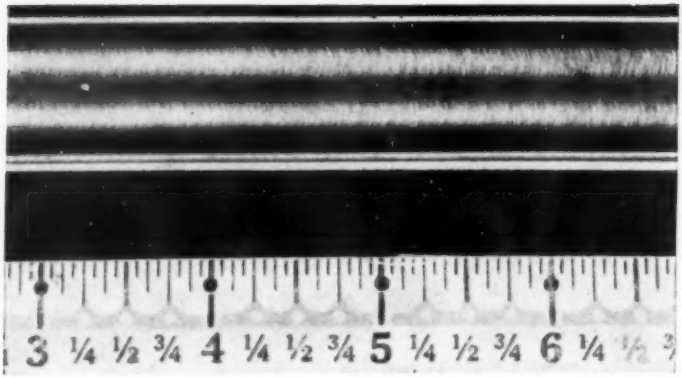

Fig. 8—Here is the shaft shown in Fig. 7, almost completely Superfinished. Faint traces of chatter marks may yet be seen. This demonstrates the removal of ridges and high spots to produce geometrical improvement.

other to a dimension within the field of molecular attraction; they must be absolutely clean; and they must have a certain affinity for one another. The application of heat, as in soldering, brazing, or acetylene welding, is merely a convenient way of bringing the metals into intimate enough contact, with the required cleanliness. It is true that heat is usually involved in galling, and makes it more likely to occur, because it makes the metal more ductile and plastic, and thus more able to deform to the required contact. Yet it is not absolutely essential.

Under unfavorable conditions of high pressure, coupled with irregular surfaces to puncture the oil film, it becomes possible for areas of the bearing surface momentarily to be wiped clean, with the previously described conditions fulfilled, so that a weld does take place. This action may not be extensive enough to stop the bearing movement. The weld may be small and immediately break loose, but damage will surely be done to that bearing. Interaction of an abrasive sort may eventually hide this scar, but continuation of such a process will ultimately ruin the bearing. When a comparatively large area of surface is involved in such an action, it may be sufficient actually to stop the rotation of the bearing, and it is said that it has "frozen."

It becomes evident that roughness of bearing surfaces has been responsible for a very large part of the difficulties experienced in bearing operation, and that much can be done to remedy these conditions. While all ground bearings do not necessarily undergo damage to the extent of galling, there can be little doubt that practically all of them do suffer more or less from abrasive and cutting wear. The removal of imperfections in shape, and of fragmentation, are of the greatest importance. The accompanying photographs of parts exhibiting the defects described under Groups 1 and 2 are fairly representative of the average ground finish. Some samples have been received which were better, and some which were much worse. These photos illustrate the fact that the Superfinishing stone first contacts only the ridges and high spots; that these must be completely removed

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The spindles of Milwaukee Vertical Milling Machines

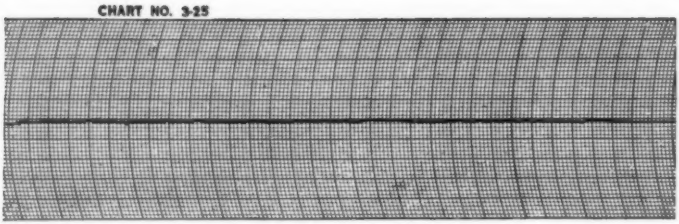

Fig. 9—Brush chart of stud after Superfinishing to the degree shown in Fig. 3. The reading was 1-¾ micro-inches. Fig. 10 gives the reading before superfinishing.

before a cleanup is obtained; and that a surface greatly improved in a geometrical sense is achieved, one that immensely reduces the likelihood of metal to metal contact.

The Mating Surfaces

The question has been asked many times, whether it is necessary or advisable, to Superfinish both a spindle and it's bushing. While comparatively little has been determined as to the effects of so doing, certain experimental work at the Foster Division indicates very desirable results thereby, under the proper conditions of lubrication. Fortunately, we do not have to depend upon speculation as to the effects of Superfinishing the spindle only. Practical experience has shown, in scores of instances, that in the latter case, very substantial improvement in operating conditions can be depended upon. It seems that the removal of grinding spirals, etc., effectively eliminates the possibility of interlocking of these defects, together with any abrasive or cutting wear.

To indicate one example of many, of the results so obtained, one of the leading engine lathe manufacturers has been faced with the fact that machining speeds have increased rapidly with the use of modern alloy tool bits. They felt it was imperative that spindle speeds be increased, yet their limit had been reached without the use of much more expensive construction. The possibility of obtaining the results desired by Superfinishing was brought to their attention. Trial of the process, on the spindle only, convinced them that the spindle speed of one model could be increased from 1200 to 2600 r.p.m., with only a fraction of the former temperature rise. The clearance has been reduced to only a third of its previous dimension, and kerosene with 10 percent of 10W oil is now used as a lubricant.

A considerable number of these lathes have been in customers' hands for some time, and have given no trouble while operating at high speeds. It

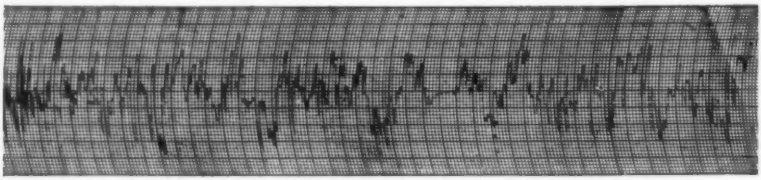

Fig. 10—Brush chart of stud (Fig. 3) before Superfinishing. The reading was 32 micro-inches. Fig. 9 shows the chart for the same part after Superfinishing.

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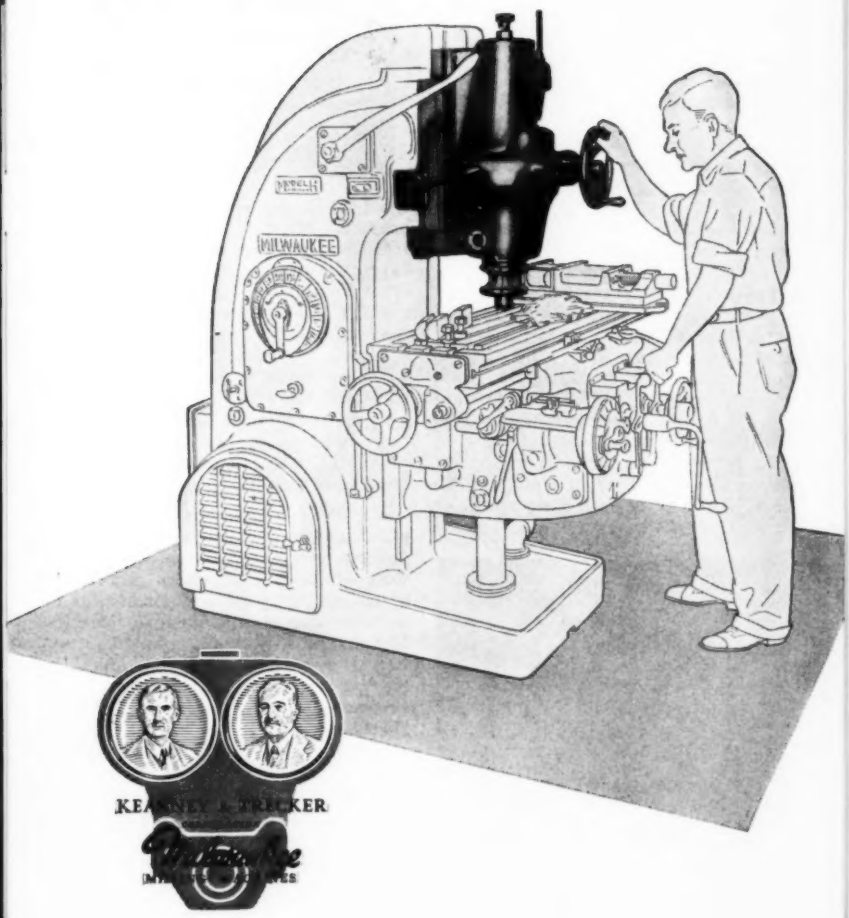
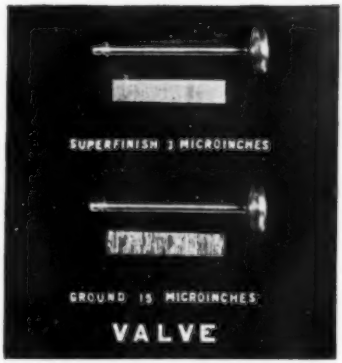


MILWAUKEE MILLING MACHINES

is a significant fact that, notwithstanding the more than doubled spindle speeds, and the use of greatly reduced clearance, there is only a fraction of the former temperature rise. In spite of the fact that an extremely light lubricant is being used, apparently no harmful metal to metal contact exists, or there would surely be more development of heat.

Transfer of Heat, Fatigue, and Directional Influence

Bearings subject to variation in temperature of operation suffer in several ways. The expansion due to heat will cause the amount of clearance to vary, and seizure may be the result. The viscosity of the lubricant should bear a direct relation to the amount of clearance, yet this quality will be altered by a rise in temperature. Some bearing metals with a low affinity for steel, such as babbitt, also have a low tensile and fatigue strength. Heat is the enemy of such metals, as it still further lowers these properties, and is often the cause of cracking of the bearing surface through fatigue failure. It is apparent that it is important to conduct the heat away from the bearing just as rapidly as possible. This may be done either through a very copious flow of oil, or through mechanical design in which



the heat is transferred by the metal housing. Naturally, a combination of the two is more efficient. In most cases, the bearing itself is a part separate from the housing, and unless the surfaces which form the union between them are very closely fitted, transfer of heat is inefficient. It is essential that waviness, ridges, or other defects which may interfere with proper metallic contact, be removed. Specially designed Superfinishers are being used to improve the main bearing housings of automobile motors, to this end.

Another consideration relative to the spiral ridges, is their effect on the resistance to fatigue failure of parts other than bearings. This is a particularly important item in such industries as aviation engine manufacture. Imperfections in the surface, where localization of stress can occur, are often the starting points for cracks which can progress to fatigue breakage. Grinding ridges, as well as other kinds of defects, can easily be important factors from this standpoint, when the safety ratio approaches one to one.

The last harmful effect of grinding ridges is their directional influence, not only on the coefficient of friction, but on the relative amount of abrasion as well. It has been proven in the la-

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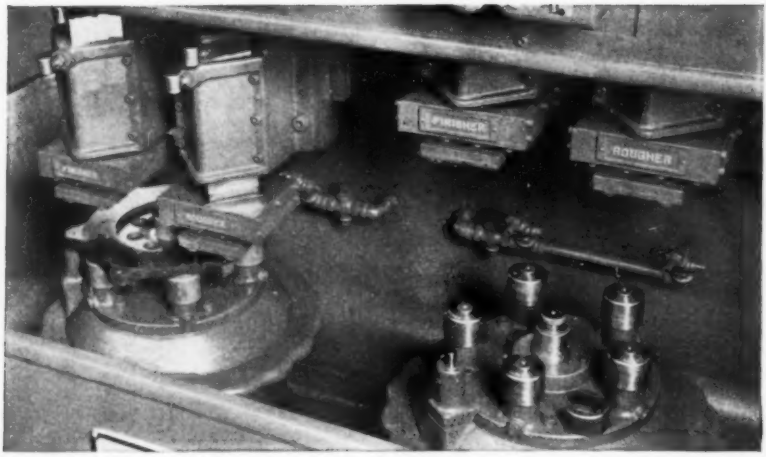

Fig. 11—Closeup of stone carrying heads and work-holding fixtures on two station Superfinisher for clutch pressure plates. Plates have a turned surface of 200 to 250 micro inches r.m.s., and are Superfinished to 5 to 7 r.m.s. micro inches at a rate of 90 to 100 per hour.

boratory, and in service, that such ridges should be moved parallel to each other to reduce friction to the lowest degree. The effect of their complete removal is obvious. Even where ridges exist on one surface only, their direction of movement with relation to the mating surface is usually of importance. Consider the case of a pump rod sliding through a packing gland. Here the ridges are disposed in a direction at a right angle to the motion of the rod. They must act as a rasp, which will wear the packing much faster than would the smooth, non-directional surface produced by Superfinish.

Brake and Clutch Frictional Surfaces

Due to the inefficient cutting angles of grinding grits, metal is thus removed by a tearing action which results in considerable fragmentation. The effects of the loosening of this material through contact with the mating surface has already been described in connection with abrasive wear. Its removal, before assembly of the parts, is also important in the case of non-lubricated bearings such as brake and clutch mechanisms. Little imagination is necessary to picture the results of applying such surfaces to the clutch or brake facing. If the roughness does not succeed in quickly wearing it away, metal fragments are torn loose from the drum or plate to embed themselves in the facing material, and render them less efficient.

One of the essential functions of brakes is to dissipate heat resulting from their application. Braking over a long period of time can cause sufficient temperature rise to burn the lining and score the drum, unless the surfaces are smooth enough so that intimate contact is provided for rapid transfer of heat away from them. More than 20 high production Superfinishers are in daily operation, producing smoother surfaces on brake drums, brake linings, and clutch

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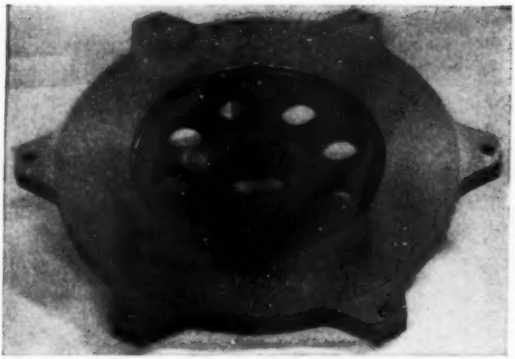


Fig. 12—Turned clutch pressure plate as delivered to the Superfinisher, (Fig. 11), with a Profilometer reading of 230 micro-inches.

pressure plates. The action of these parts is thus made smoother, more positive, and much longer-lived.

Metallurgical Defects

The group of defects designated as metallurgical are changes in the surface layer of metal due to the heat produced in grinding. These changes are particularly important when the part is made of hardened steel. The objections to roughness have already been discussed, but sufficient attention has not been called to the heat generated by line contact of grinding wheel and work, under high pressure and great power. The result is a momentary production of heat at the line of contact, which many investigators have reported to be in excess of 2,000 degrees F., no matter how much fluid may be applied.

Naturally, this condition varies considerably in the extent of its effects, depending upon the intelligence and experience with which the grinding variables are chosen. In any case, it can be said safely that hardened steel can never be ground without the production of some depth of annealed surface. It may be less than one ten-thousandth of an inch, and it may be several thousandths of an inch, but whatever this depth may be, the very

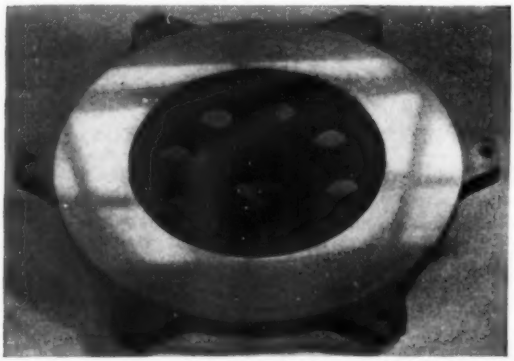
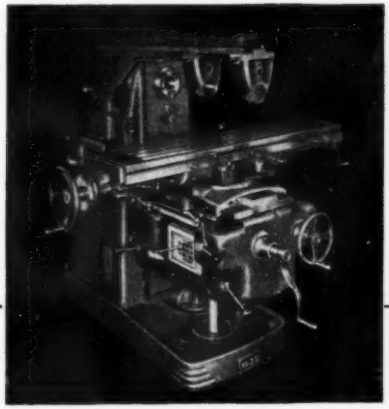


Fig. 13 — Superfinished clutch plate with a Profilometer reading of from 5 to 7 micro-inches.



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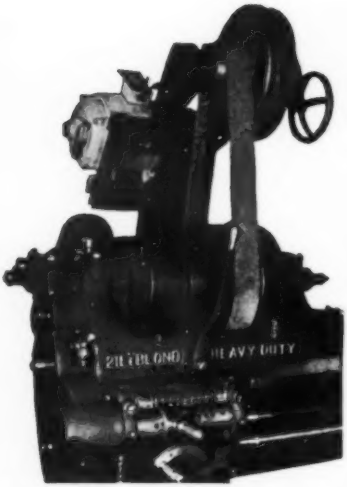

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outside dimension is not at all what it was intended to be. The bearing metals, and other conditions, may have been chosen with the expectation that certain operating results would be obtained, but the presence of these soft ridges will make it very unlikely that they will ever be realized. Galling and scoring are much more probable.

In extreme cases, with improper bond hardness of wheel, too fine grit, etc., a thin layer of metal actually may be flowed like thick paint from high spots to fill in low ones. This condition, which may be described as both mechanical and metallurgical, and thus of both Groups 3 and 4, is often purposely produced in order to obtain a bright surface for steel mill rolls, etc. Many people refer to such a layer as "smear metal". It is brittle, has little real attachment to the parent metal, and is easily spalled off under unit pressure of any consequence. Too often it is unintentionally produced in an effort to obtain an exceptionally fine finish.

Before the development of a satisfactory means of measuring surfaces for roughness, and of reducing these bearing deficiencies, it seemed that most manufacturers gave their consideration to specifications concerning steel analysis, heat treatment, dimensional accuracy, and to tensile strength. They apparently ignored the most important of all, which is the very outside layer of metal on the surface of the part. Isn't it a fact that all other specifica-

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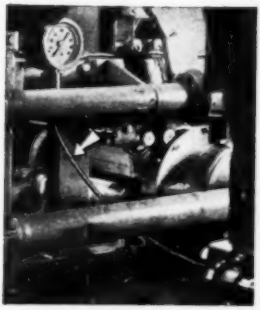

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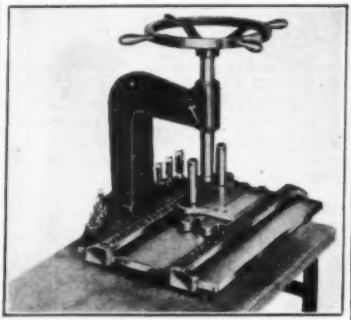

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tions are used to insure the maintenance of a certain area, with no dimension of thickness, in the proper relation to its mating surface? It is true that a high tensile strength may be necessary in order to support this area, but it is the area itself that really is the important item.

To illustrate this idea, an example may be cited of an experience with a certain aviation engine part. Trouble had been encountered with galling and sticking of the articulating pins which secure the minor rods to the master rod, and motor failures had resulted from this cause. The pins were made of five percent nickel steel, very carefully heat treated to obtain maximum strength and hardness, and ground to limits of plus or minus one ten-thousandth of an inch. Yet, in attempting to obtain surface smoothness, a grinding wheel too hard and of too fine grit was being used. The surface was being annealed to a depth of one quarter-thousandth of an inch. The usual methods of hardness testing would not detect this condition. Only a file would find it. However, application of a Superfinishing stone of the proper bond hardness for working on very hard steel immediately disclosed the burned surface by cutting faster than it should. In no other way was this pin defective yet it was rendered absolutely useless for the intended purpose by a surface area that was too soft. Grinding with a freer cutting wheel to a somewhat

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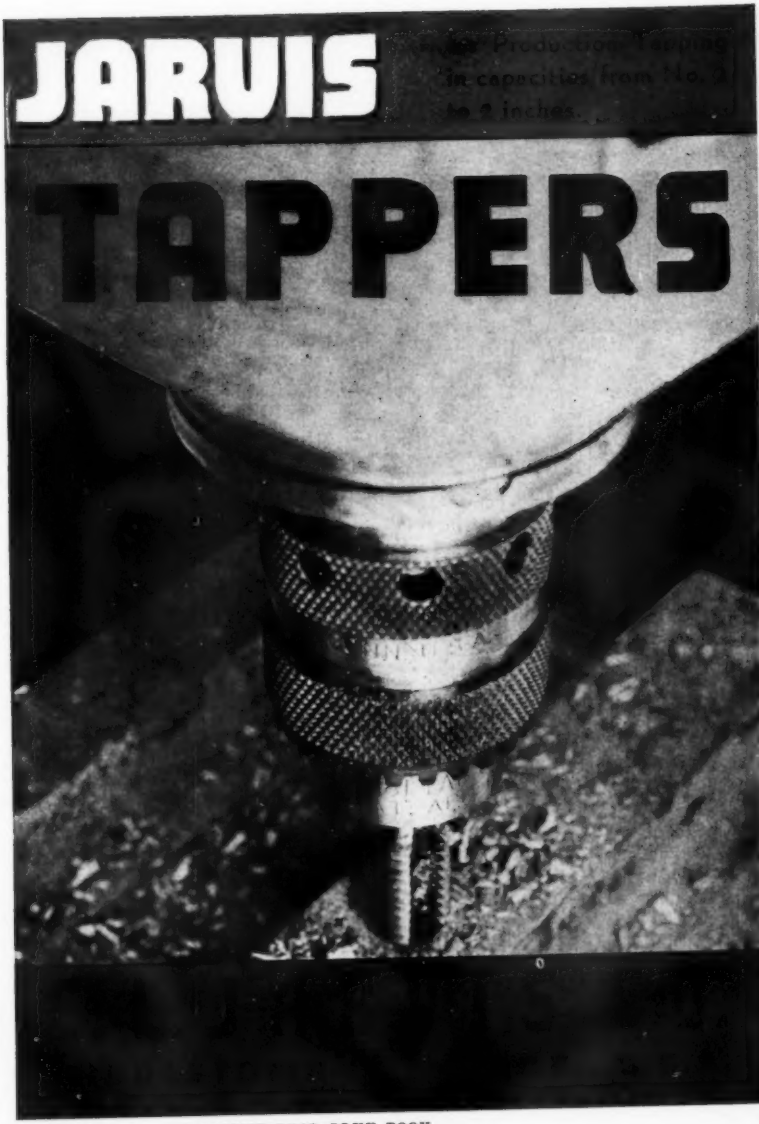
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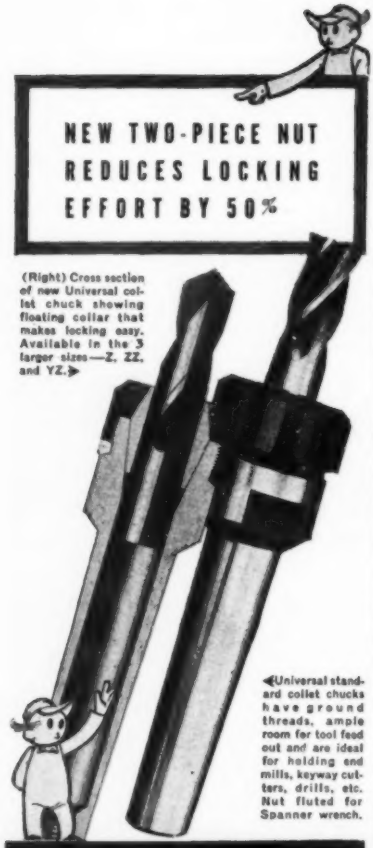
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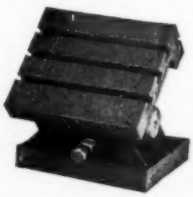
rougher finish, followed by Superfinishing provided a surface of the correct hardness and of practically perfect geometrical shape.

Should Bearing Smoothness Vary?

A question often debated is:- Granted that improvement in geometrical shape, and removal of the fragmented and annealed layer has been accomplished, and that whatever scratches exist lie below this true cylindrical plane, what is the proper degree of smoothness for each bearing condition? Much remains to be learned regarding this question, but there can be no doubt that we must consider not only the operation under full fluid film conditions, but under boundary or deficient lubrication as well.

Under normal operation the production of perfection in shape, without the spiral ridges and waviness of surface, makes the maintenance of an oil film of uniform and efficient dimension comparatively easy. Here it is believed that some latitude in scratch depth can be allowed without appreciable difference in operating conditions. The essential condition is the provision of a surface with much the larger percentage of its area within a true cylindrical plane, **with no projections above that area.** As an example, the lathe manufacturer previously mentioned finds no difference in the operation of spindles Superfinished to Profilometer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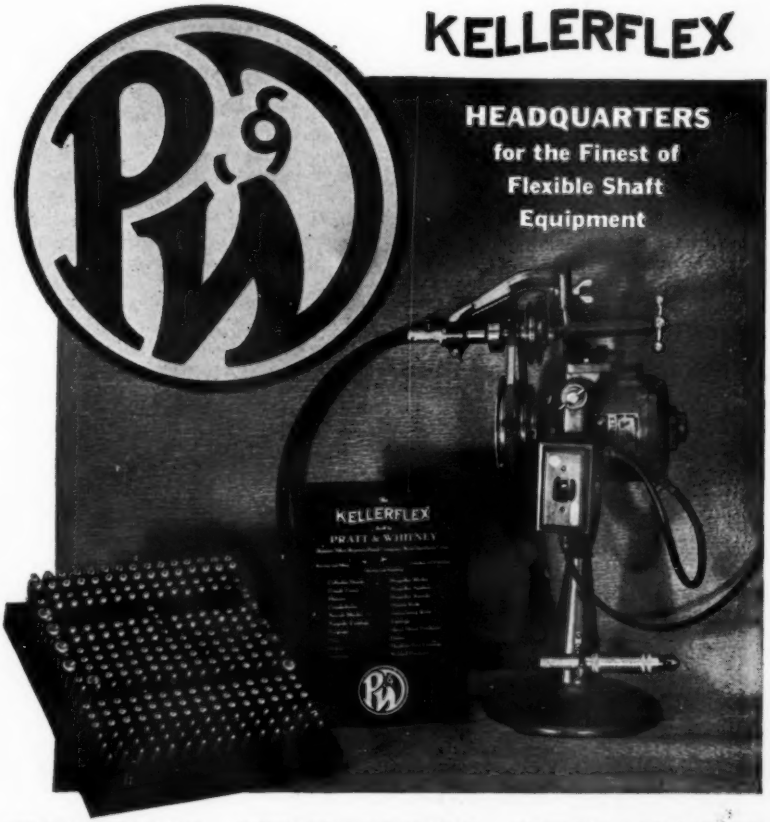

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readings of one and three micro-inches.

While conditions of boundary lubrication are never intentionally created, they are inevitably encountered in the best designed mechanisms. This is especially true in starting after a period of idleness, where reciprocating motion is in use which allows the film build-up to dissipate at the end of each stroke. So we are concerned, not only with the factors that contribute to the maintenance of a puncture-proof oil film during continuous motion, but to those that allow the least amount of damage during unavoidable reduction of the film to a minimum.

Due to the wide variation in bearing conditions through the use of many different combinations of metals, of methods of lubrication, of pressures, etc., it is out of the question to do more than point out the fact that scratches below the true bearing area can act as oil reservoirs and redistribute an oil film through capillarity. Examples of the factors which would seem to encourage the use of a high degree of surface finish are:—An efficient lubrication system; mating metals of low galling capacity, such as treated steel against babbitt; and the use of light oil of high spreading capacity through capillarity. Here the smoother steel surface would cause little or no damage on starting, and the oil film would quickly reform. Those which would appear to make desirable the production of a surface of greater scratch depth, say up to five or six micro-inches, are the employment of unhardened steel against bronze, with the use of a heavier lubricant and a less efficient oiling system.

Conclusion

As has been observed, much work remains to be done in the determination of the relationship of surface smoothness to the efficiency of appli-

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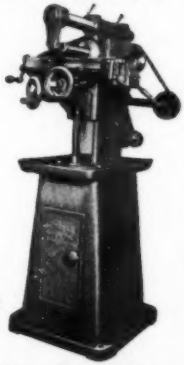

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cation of the lubricant; amount of clearance; weldability of the mating metals employed; viscosity of the oil; and other conditions. In any and all cases, it is earnestly believed that it is of the greatest importance to provide surfaces of the truest possible geometrical shape, with all scratches below it. The elimination of ridges and high spots, of fragmented and annealed material, allows the maintenance of an efficient and uniform oil film thickness, and of the least possible damage upon metal-to-metal contact. The unevenness of all ground and otherwise machined surfaces is a feature which is detrimental to any bearing situation. The present day standards are beginning to assume them to be produced as a roughing operation, for production of size only.

Fig. 14—Full view of Superfinisher for clutch pressure plates (Figs. 11, 12 and 13).

There are a number of reasons for the refinement of surface as provided by Superfinish, other than for cylindrical bearings. Among these applications are:—For thrust bearings, reciprocating bearings, rolls for cold finishing metal strip, static bearings, frictional surfaces, cutting edges of reamers, drills, and other tools, forming punches for metal shells, roller bearing races, and scores of other uses. Numbers of instances could be cited of longer life and improved operation obtained through Superfinishing such parts. It is regretted that space has permited so little more than the discussion of lubricated bearings.

With the methods described herein of examining surfaces, and of correcting their deficiencies, surface area is beginning to receive the consideration it has long needed. It is the real load carrier, and should have just as much attention as tensile strength, heat treatment, accurate dimension, or any other specifications.

Illustrations—Courtesy Foster Machine Co., Div., International Machine Tool Corp., Elkhart, Ind., Bay State Abrasive Products Co., Westboro, Mass., and The Brush Development Co., Cleveland, Ohio.

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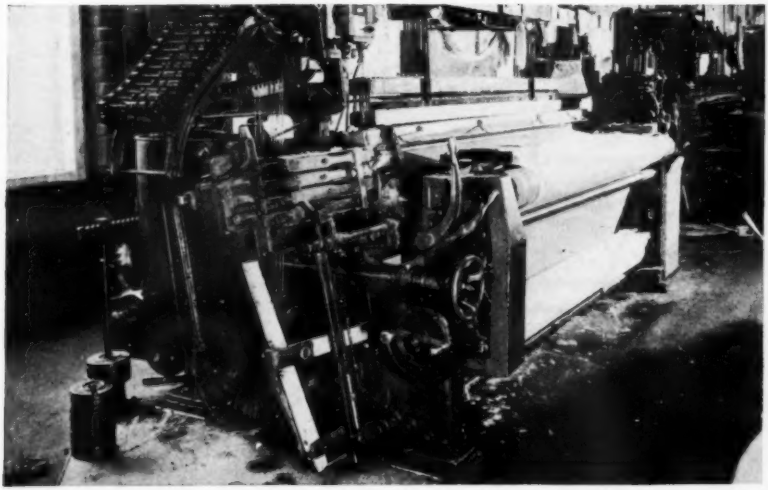

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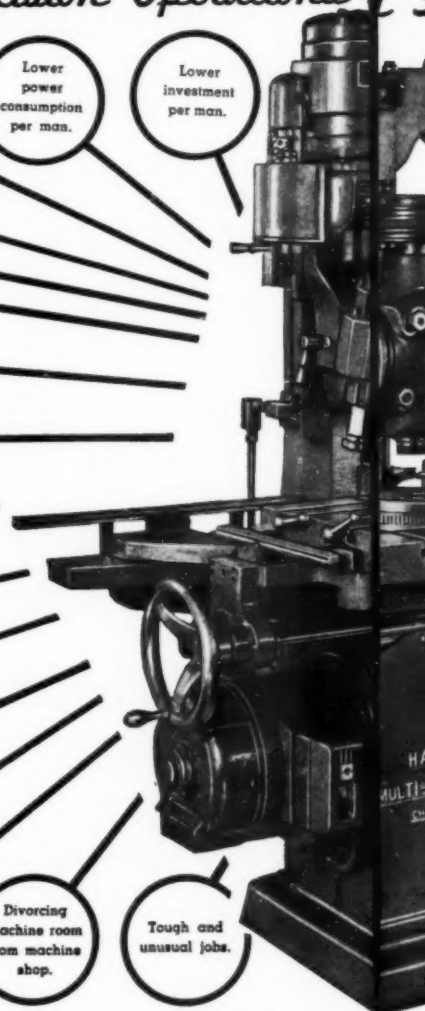

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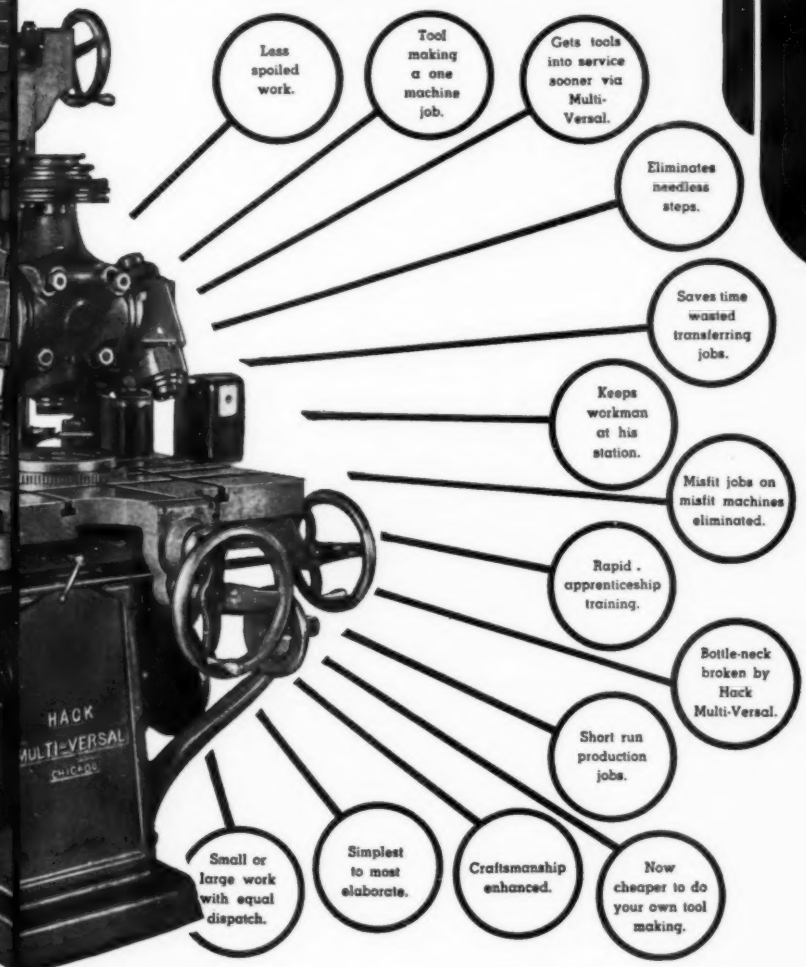
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As a production executive interested in getting more out of existing tools and machines, by eliminating such superfluities as tradition, reciprocity, etc., will you consider the following suggestions? They may solve your problems.

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1. Encourage your purchasing agent to consider bona fide new cutting oil developments. Ask him to open the door wide to the qualified vendors possessing the all important credential of well founded information on the lubrication problems of today.

2. Remind your factory manager, superintendent or test engineer that the policy of trying out well recommended cutting oil products can be of vital importance and may quickly open up bottlenecks in the road to increased production.

3. Suggest to your metallurgist that machinability troubles can frequently be cured by getting the right cutting oil to fit the job, preferably selecting one with a sufficient factor of safety to provide for occasional metallurgical irregularities.

4. Inform your tool engineer that when deliveries of small tools are slow or difficult to obtain, it may be that the opening of the door and the help of a qualified cutting oil engineer may prolong the life of the tools on hand, thereby reducing appreciably this particular bottleneck in a quick and simple way.

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Machine Tools for Big Guns

By G. A. SPOHN

MANY of us are interested in big guns—their construction and operation—and we all recognize them as an effective means of defense from any unfriendly power. In addition, there is a certain fascination about the sudden change from an apparently lifeless, inert thing to a veritable instrument of activity at the instant of firing.

This intense activity causes tremendous stresses to be exerted, and the evolution of a gun that can stand the resulting strains has been slow indeed. It has called for all of the ingenuity of the chemist, the steel maker, the gun designer, and numerous others.

The gun designer has continually demanded larger, heavier, and unbelievably accurate machine tools, because after all, no gun can be better than the tools that make it.

A large caliber gun is built up of several cylinders. These are called the liner, tube, and hoops, and made from forgings. A casual inspection of the various parts will show them all to be cylinders of various lengths and diameters. This accounts for the various sizes of machine tools required to make the parts. In general, the machine used to make the large diameter hoops can be comparatively short while the machine for the smaller diameter parts will be quite long.

In order to withstand the tremendous strains resulting from the explosion without excessive expansion of the liner, the gun is constructed on a principle known as "initial tensions." The hoops have a smaller internal diameter than the outer diameter of the inner members, and this causes permanent compression forces in the inner members which must be entirely overcome before any expansion strain will be transmitted to the various parts of the gun.

Two types of special tools, the turning lathe and the boring lathe, have been

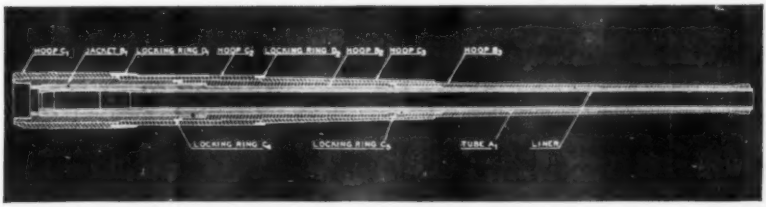

Fig. 1—Cross Section of Large Gun Barrel showing the several cylinders of liner, tube, and hoops, all made from forgings.

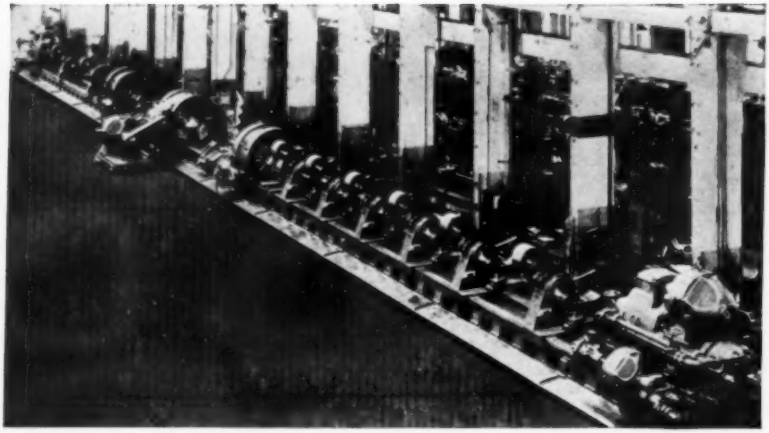

Fig. 2—A Typical Double and Rough Boring Lathe for tubes. Overall length is 200 feet and will accommodate a work piece 61 feet long and 24" in diameter.

developed to machine the various hoops, tube, and liner. In some cases both types have been combined in one machine. A typical rough turning lathe for the jacket and hoop gun forgings will swing a work piece 84" in diameter and 50 feet long over the carriages. (See Figure 2.)

A double end rough boring lathe for tubes, which ordinarily are solid forgings is shown in Figure 2. The boring bars are not installed. The overall length is 200 feet, and the center drive is powered by a 75 h.p., - 4 to 1 ratio adjustable speed motor. The forging is clamped in the center driving head, and the ends are supported in the rotating steady rests which are adjustable along the bed to suit the length of forging. The maximum size of work piece that can be accommodated is 61 feet long and 24" in diameter.

In the 43" boring lathe, the carriage is for spotting the work preliminary to the boring operation. The machine will bore a work piece up to 46 feet in length and 40" in diameter. An adjustable relay is provided for the drive and feed motors which will cause a bell to ring in case of overload. This warns the operator if any unusual load develops and thus prevents damage to the equipment. Centralized control for all of the machine is provided by the push-button panel located convenient to the end of the work piece.

The gun is built up by cooling the tube and by heating the jacket. This causes the jacket to expand and it is then slipped over the tube and cooled which causes it to contract and grip the tube. The other hoops are assembled in the same fashion. The permanent strains in the assembled gun are obviously dependent upon the accuracy of machining the various parts, most tolerances being not over .001".

After the gun has been completely assembled, it is placed in a lathe as shown in Figure 5 for finish turning and boring. This lathe will machine a gun of 20" caliber, and outside diameter of 84" and a length of 87 feet. The lathe has a length of 212 feet and weighs

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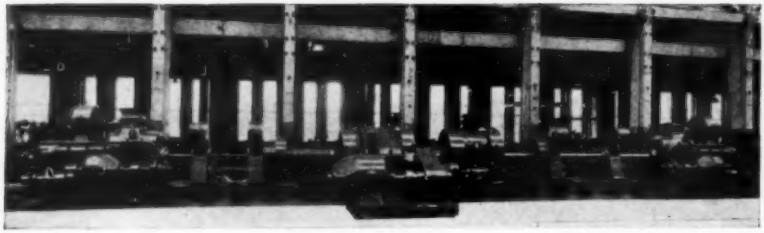

Fig. 3—Tube Lathe Boring a Test Piece. Each rotating bar is driven by a 25 h.p. motor with a 4 to 1 gear range. Individual traverse motors are used for each boring drive.

421 tons, yet will finish bore to within .002" oversize and zero undersize. A 100 h.p., motor is used for the faceplate and feed drive.

Smaller sizes of the big guns, including 6" caliber are made of one forging, or of one centrifugal casting. The gun is turned on a lathe as shown in Figure 6. This particular lathe has a 60" diameter faceplate driven by a 50 h.p. induction motor which also provides feeds for both carriages. A separate motor is provided on each carriage for rapid traverse. There is no clutch in the main drive, quick stopping being accomplished by plugging the motor. The motor is started and stopped from either carriage.

A double end boring lathe of the hollow spindle type is shown in Figure 7. The gun is rough bored on this lathe by turning the work in one direction and at the same time turning the boring bars in the other direction. High pressure coolant is forced through the boring bars to cool the cutters and to wash the chips away. The 30 h.p., 575/1725 r.p.m., main drive motor is started, stopped or reversed and the boring bar tailstocks moved in feed or rapid traverse in either direction from the control levers which can be slid along the front of the bed. The feed is driven from the main drive motor and fast traverse is supplied by a 7-½ h. p., motor. A motor shifted clutch is used

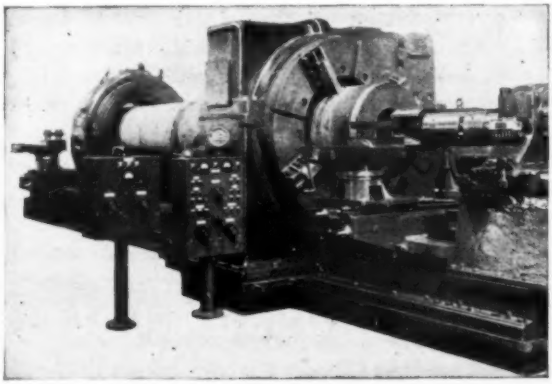

Fig. 4—Driving mechanism of a 43" Boring Lathe. This machine will bore work up to 46 feet long and 40" in diameter.

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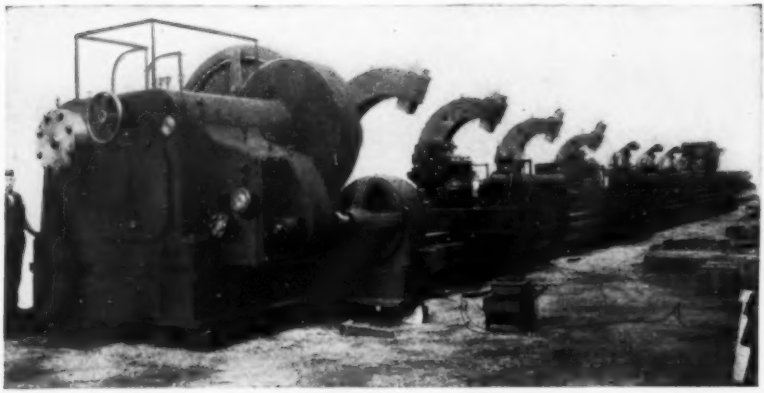

Fig. 5—Finish Turning and Boring of gun barrels are done on this lathe which will accommodate barrels up to 87 feet long and 84" outside diameter.

to select the movement and direction of feed. This lathe is also suitable for finish boring from one end.

Figure 8 shows boring bits used for machining large guns. The bit on the right is for rough boring, the center for semi-finish, and the one on the left for finish boring.

The packing for the semi-finish and finish boring bits is of hard wood properly seasoned and slightly larger than the cutter diameter. The packing acts to guide the cutter and thus insure an accurate bore.

After the gun is turned and bored to approximate dimensions, it is subjected to a high internal hydraulic pressure which expands it. During this process, an arbor is first inserted in the bore which serves the double duty of almost filling it, thus reducing the amount of liquid required and of relieving the tube of most longitudinal strains. As the pressure is increased, the metal closest to the bore expands and exceeds its elastic limit and takes a permanent set. The outer metal is still below its elastic limit so when the pressure is

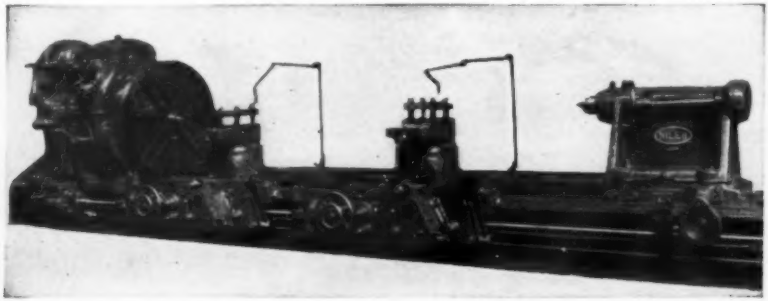

Fig. 6—Small Guns Up to 6" Caliber are turned out on this lathe. The 60" faceplate is driven by a 50 h.p. induction motor.

Playing its part in national defense, this Haskins Type C Tapper is pictured in one of the Government Arsenals tapping a shell case to a *Class 3 fit.* Air-controlled Type C Tappers are delivering *extra* accuracy and speed on all kinds of jobs—even tapping to *micrometer* accuracy for a leading manufacturer of micrometers!

ONE WORD TELLS YOU WHY this one machine leads in *both* speed and precision . . AIR! *Built-in* air control that entirely regulates the action of the Haskins super-sensitive taphead. That entirely eliminates operator errors. That guarantees the same *cushioned* pressure stroke after stroke—the same *precision* results hour after hour and day after day!

Tap breakage and sharpening expense go *down* because, once the machine is set up for the job, it will not force or load the tap. Production goes *up* because the operator can devote *all* his time and attention to loading and unloading the work. Costs per tapped piece are *less* because you get *more* tapped pieces per man hour!

Don't you want faster precision tapping production and lower tapping costs in *your* plant? Write for a free booklet giving complete details about the three capacities in which the Haskins Type C Tapper is available. It shows many interesting applications including magazine, dial and hopper feed operations. R. G. Haskins Company, 623 S. California Avenue, Chicago.

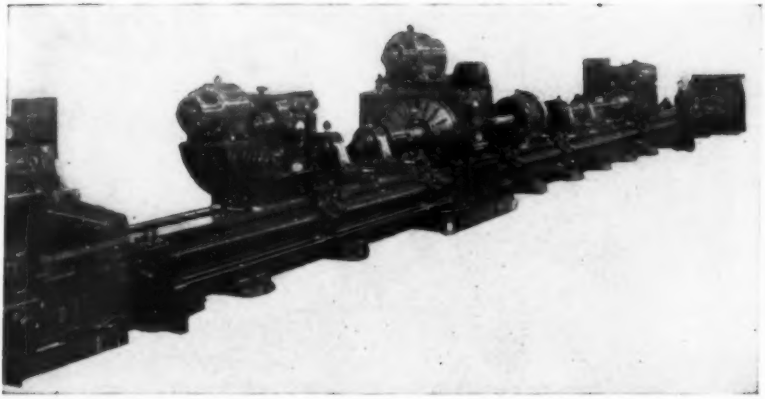

Fig. 7—Guns Are Rough Bored on this double end boring lathe. High pressure coolant is forced through the boring bars to cool the cutter and wash the chips away.

released, the outer metal tries to return to its initial diameter but is restrained by the metal close to the bore which has taken a permanent set. This results in permanent internal strains similar to those obtained in a built-up gun and is actually stronger because the number of steps or hoops in this gun is infinite while the built-up gun has only a few hoops.

This process of expansion is known as "autofrettage" or "self-hooping". Different pressures are used depending upon the thickness of metal in various parts of the gun. After completion of the pressure application, the gun is rough bored and turned and then the finish cuts are taken.

The gun, be it of the built-up type, or made by the Autofrettage process is then ready for rifling. This operation consists of cutting many small spiral grooves in the bore surface of the gun. These grooves act to give the projectile rotation which results in steadiness of flight. As a general rule, the grooves have a depth of between ½ and 1 per cent of the caliber and in number are about six times the caliber, although this is not a fixed rule.

By the amount of "twist" is usually meant the number of calibers traveled by the projectile for one revolution, as "one turn in 25 calibers", just as a matter of interest and to use terms normally used by us. The r.p.m., of a 6" projectile at 2800 ft./sec., rifled one revolution in 30 calibers would be:

$$\text{R. P. M.} = \frac{\text{Total travel in inches per minute}}{\text{(number of inches traveled per revolution)}}$$

$$\text{or} \quad \frac{(2800)\ (12)\ (60)}{(30)\ (6)}$$

or 11, 200 R. P. M.

The twist can be either "uniform" where the grooves follow a constant spiral, or "increasing" where the grooves have little or no twist at the powder chamber end but have a progressively greater twist toward the muzzle.

Originally "uniform twist" was used exclusively but, due to the fast burning powder, resulted in excessive wear at the origin of the rifling. This led

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20 minutes to less than 1 minute
COST CUT FROM
20c to 2.8c

A manufacturer of hydraulically operated dump bodies was taking 20 minutes to lap a valve body at a cost of 20c each. The Sunnen Precision Honing Machine now does the job in less than a minute at a cost of 2.8c! Naturally the Sunnen Precision Honing Machine can't show such sensational savings on all jobs but it is helping hundreds of manufacturers to economically produce more accurate holes with better surface finishes. What's your problem? Why not tell us about it?

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Accurately sizes and finishes internal cylindrical surfaces from .185" to 2.400" in diameter! Produces super-smooth surface finish. Accuracy within .0001" guaranteed.

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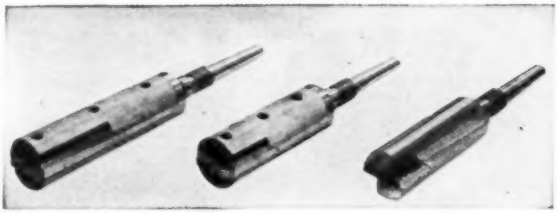

Fig. 8—Boring Bits Used for Machining Large Guns. The bit on the right is for rough boring, the center for semi-finish, and the one on the left for finish boring.

to the use of "increasing twist" which reduced this wear. Present day slow burning powder and knowledge of gun manufacture however have greatly reduced the advantages of "increasing twist".

Figure 9 shows the type of machine used for rifling the gun. This particular tool will handle guns up to 20" bore diameter and 82 feet long. It is about 208 feet long and is driven by a 40 h.p., 200/1200 r.p.m., planer type motor geared so that the rifling bar speed can be adjusted between nine and 54 feet per minute. A 5 h.p. pump motor supplies high pressure coolant to cool the tools and wash away the chips.

The preliminary set up to rifling the gun is to set the "former ribbon" to the desired position. As the rifling bar is moved forward, it is rotated by a rack, moved by the forming ribbon and meshing with a gear on the bar. A planer type tool on the front bar support is used to cut a groove in the bar which is used as a guide to turn the bar when actually rifling the gun.

Centralized pushbutton control for all operations on the machine is provided close to the muzzle end of the gun. An adjustable load limit relay with alarm bell and load indicator warns the operator in case of any unusual load on the drive motor.

Several grooves are cut simultaneously in a manner similar to the operation of a planer except that the tools move, and the work is held stationary.

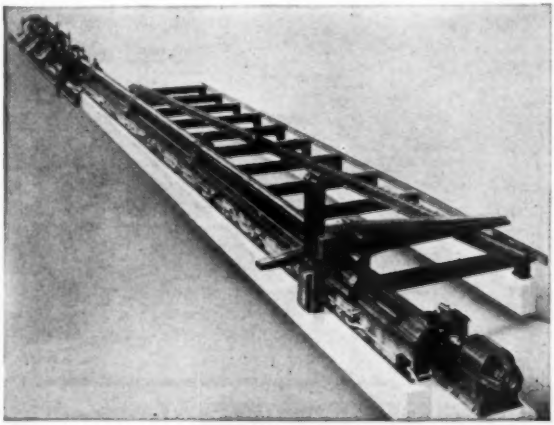

Fig. 9—Rifling the Gun is done on this machine which handles barrels up to 20" bore and 82 feet long. Rifling speed is adjusted between 9 and 54 feet per minute.

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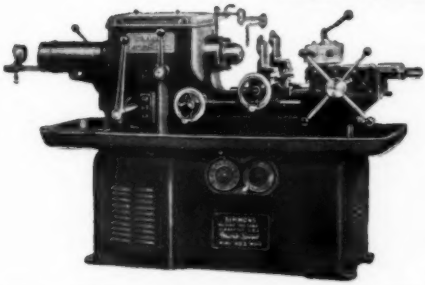


▲ NEW CABINET BASE. *Micro-Speed Drive* offers range of speeds to 1500 RPM. Spindle brake and Selector Dial Control. *Built in plain and back-geared types.*

No. 2 TURRET LATHE (1¼")

"STOP AND CONSIDER," writes Charles W. Swift, of the Swift Lubricator Company, "that SIMMONS MICRO-SPEED turret lathes are being used to make bushings for a prominent aircraft concern. The material is X4130 steel, heat-treated to 150,000 tensile.

"We have turned out thousands of these parts, holding the outside diameter to .0005 tolerance, using only a stock model roll tool. These parts also are reamed to a .001 tolerance and held to length within .005".

Our production schedules are excellent, but we urge you to write today to insure earliest delivery.

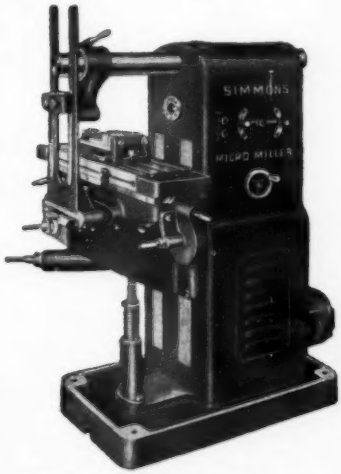
No. A-1 PLAIN MICRO-MILLER

THIS NEW No. A-1 MILLER is ideal for any plant or shop producing numerous small parts. It is the perfect tool for aircraft use and for all vocational training purposes.

An important feature is the SIMMONS MICRO-SPEED DRIVE, the variable speed unit which has proved so successful in the new Simmons turret screw machines and lathes.

Mounted inside the column, it provides a range of spindle speeds from 38 to 500 RPM at the turn of a handwheel conveniently situated.

Write for Descriptive Bulletin



▶ RANGE OF FEEDS: Longitudinal, 34"; cross, 8"; vertical, 18"; work surface of table, 27"x8".

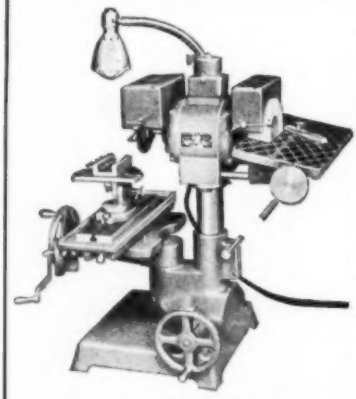
SIMMONS Machine Tool Corp.
1725 North Broadway
Albany, N. Y.
NEW YORK OFFICE: 149 Broadway

* * * * * * * * * * * * * * *

Very light cuts of from .001 to .0015" are taken. When a set of grooves is completed, the rifling bar is indexed and additional grooves cut. This process is repeated until the gun has been completely rifled. The gun is then finish turned and the ends faced off to correct length.

The point of least droop is then determined, a keyway cut and a key inserted in the slide cylinder which prevents the gun from turning.

EVERY MODERN PLANT NEEDS THIS MACHINE



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Adopting a ½-HP motor for this machine makes it easy to perform every necessary operation for the upkeep of all cemented carbide tipped tools.

Ask for Bulletin CTG40-6H.

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The yoke is put on and the gun is ready to speak its piece, both loud and often, for all the world to hear and take note that it has become an integral part of our defense against any aggressor.

Comparitol-Inspectoset Unit

The George Scherr Co. announces a new Comparitol-Inspectoset unit designed especially for shops now engaged in the production of parts to very close tolerances. The Unit is claimed to give any shop a virtual Bureau of Standards, since it enables the shop to maintain complete control over all shop gauges, mass produced parts, ball bearings, pins and other parts.

Included in the unit is the Comparitol which is graduated to read to 1/10000" plus and minus .002" and the Ultra-Chex Inspectoset consisting of 34 gauge blocks which will make up all combinations in steps of 1/10000" from .300" to 8". The Inspectoset comes in a specially designed polished case to hold this and other gauges.

The Comparitol is first set with the Ultra-Chex in the Inspectoset, after which parts can be checked quickly and easily to 1/10000" by unskilled help.

The Unit has been designed especially to eliminate rejections, disputes over measurements and to guarantee precision accuracy in interchangeable manufacture and farming out under the defense program.

Ready
RIGHT NOW..
TO BRING YOU
PRODUCTION

THIS
"Buffalo"
MACHINE

ROLLS 200 STEEL CYLINDRICAL SHELLS
per hour

(5" to 10" diameters x 10" long from 3/32" to 3/16" thickness)

No. 1-B Wrapping Roll complete as illustrated with 3 H. P. gear-motor, one 5" diameter x 10" long mandrel roll, air-operated safety features and controls, including automatic ejector, with welded Steel frame.

IMMEDIATE SHIPMENT FROM STOCK

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BUFFALO FORGE COMPANY
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HELP

KEEP PRODUCTION "on the job"

...with

SUNOCO

EMULSIFYING

CUTTING OIL

DEEP CUTS WITH HIGH SURFACE SPEEDS!

PERFORMANCE DATA

OPERATION—Turning forged spindle.
MACHINE—Monarch 10" model "W" engine lathe.
MATERIAL—S. A. E. 3250 steel.
CUTTING SPEED—250 S. F. P. M.
DEPTH OF CUT—3/16 inch.
FEED—.017 inch.
TYPE OF TOOL—Cemented Carbide.
CUTTING LUBRICANT—1 part Sunoco to 10 parts water.

Courtesy of THE MONARCH MACHINE TOOL CO.

Greater production . . . without sacrificing accuracy and finish! This is the challenge the overburdened machine-tool must meet to accomplish our national defense program.

The place to meet this requirement is at the edge of the cutting tool with the right cutting lubricant to reduce friction and dissipate heat. And that's where the high lubricating and heat absorbing qualities of Sunoco Emulsifying Cutting Oil can really help you and your machines answer production demands.

Turning, shilling or drilling - Sunoco permits the rapid removal of metal and maintenance of close tolerances . . . with decreased "down-time" for tool re-grinding and resetting. That's why we urge you to test Sunoco on results alone. Write today for full information.

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SUN OILS

PETROLEUM PRODUCTS FOR ALL INDUSTRIES

Production Engineering in the Defense Program

By M. L. HUTCHENS

THE Defense Program, with its enormous volume of requisite production, has necessitated design and manufacture of special equipment ranging from large and entirely single purpose machines down to small milling fixtures and drill jigs. This designing and manufacturing is now being carried on at an unprecedented rate. It is the purpose of this article to describe, with suitable illustrations, several of the more interesting milling machine setups being built to help produce the thousands of necessary parts which go into various defense mechanisms.

Milling is playing an important role in the fast machining of the many special alloys. In the past few years the standard milling machine has been developed to a point where it can produce much more accurately and speedily, and milling has displaced many intermediate operations. Recent tests have shown that the finishes obtained by milling are often as good, and in some instances even better, than those produced by grinding. New cutting steels and sintered materials, such as tungsten or tantalum carbide, new cutter designs and tougher, harder-to-

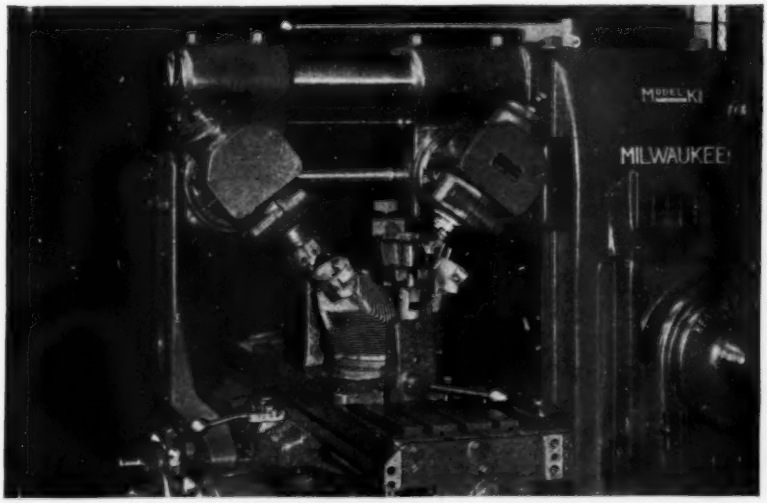


Fig. 1—Standard Knee Type Milling Machine equipped for milling airplane cylinder heads on a production basis.

machine alloys made it necessary to produce new milling machines capable of handling these cutting tools and tougher steels. A rigid machine, capable of high speeds and embodying a wide feed range was produced that brought "finish by milling" to the fore. The flexible knee-type milling machine lends itself quite readily to a great variety of production set-ups. The bed-type machine, too, while not so flexible as the knee-type, is also playing a big part in rapid machining on a production basis. A standard milling machine can, with a slight amount of special equipment, be made into a production machine. Today this is especially important when time is so vital.

A typical example of this is shown in Fig. 1. Here is shown a Standard No. 3K Plain Horizontal machine which was equipped to finish the rocker-box faces on radial motor aluminum cylinder heads. The addition of two special vertical swivelling heads and a special fixture completed the transformation from a standard to a single purpose milling machine. The inner head was locked around the column dovetails and also clamped to the two cylindrical overarms in order to increase the rigidity. The outer head was supported on the extended overarms and tied to the machine knee by an outboard support. Spiral bevel gears and anti-friction bearings were used throughout. Vertical adjustment was obtained by mounting both swivel head spindles in quills. In an ordinary set-up it would be necessary to have a spindle adjustment in only one head, the workpiece being set to the rigid cutter, first by adjustment of the machine knee and then adjusting the other cutter by the quill movement. Since the surface to be milled is at an angle to the machine table, both spindles were made adjustable, otherwise a cross adjustment would be necessary to center the workpiece between the cutters.

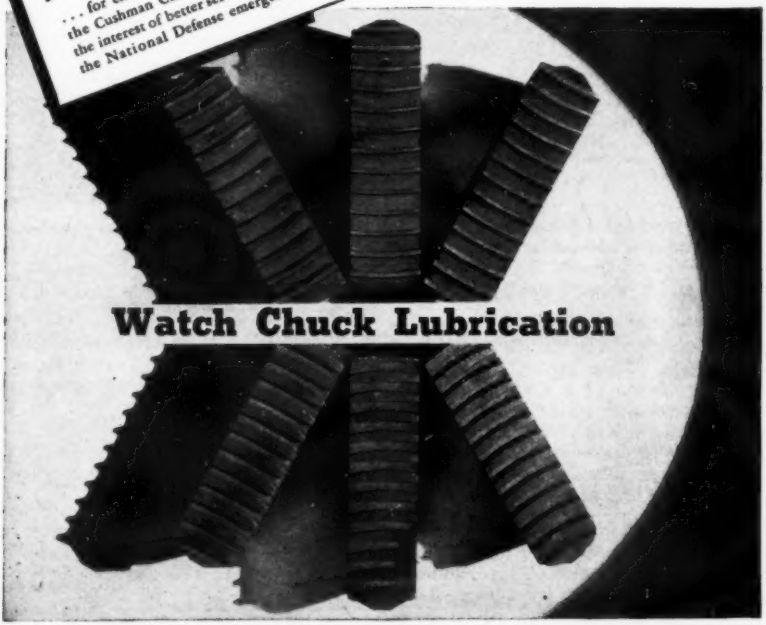
The outer head is adjusted relative to the inner head by a screw and nut arrangement between the two. The drive for the heads is taken from the machine spindle directly into the inner head which drives through four spiral gears to the spindle. A six spline shaft connected to the machine spindle transmits power to the outer head. The spindles run in opposite directions, the outer clockwise, the inner counter-clockwise. Since the machine is right handed, i.e., fed from right to left, the cutting pressure is downward directly

Fig. 2—Contour milling radial motor connecting rods using special rise and fall fixtures.

Timely SUGGESTIONS

. . . for chuck users. Published by the Cushman Chuck Company in the interest of better service during the National Defense emergency.

Cushman Chucks are built to "take it" but they deserve the same careful attention you give your fine machine tools - - - - - - -



Watch Chuck Lubrication

Machines as well as men are working harder these days. They'll need a little more careful maintenance, closer attention to lubrication, for example, if we are to conserve important equipment while stepping up output. These unretouched photographs of a set of jaws recently returned to us . . . and a similar set of new jaws . . . show how the useful life of a fine chuck can be shortened by lack of proper internal lubrication. There's really no excuse for this. Convenient grease gun nipples in all except the small sizes, make lubrication of Cushman Self-Centering Chucks easy. Simple shop cleanliness will prevent damage due to foreign materials entering chuck.

We suggest that you show this advertisement to the foremen and operators in your plant. Cushman Chucks will repay you for a little extra care . . . with maintained accuracy and longer service life.

The Cushman Chuck Co. - Hartford, Conn.

CUSHMAN CHUCKS

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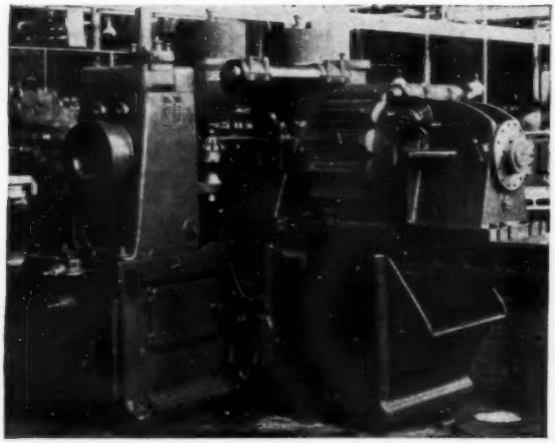


Fig. 3—Form milling army tank sprockets on a bed type milling machine.

on the machine table. Thus is eliminated any tendency to pick up the workpiece. Likewise chatter is eliminated and a better finish results.

The cutters are 4" diameter tungsten carbide tipped, inserted blade, full back face mills. These face mills are ground flat by means of a 150 grit diamond wheel, with a clearance angle of 5° and a rake angle of 3°. The outer tips of the cutter are ground to form a small radius, thus increasing cutter life by preventing breaking down of the tip corner.

The fixture is designed for maximum simplicity and speed. The cylinder is located horizontally from a hardened steel ring which contacts the outer diameter of the cylinder skirt. Location radially is obtained from a valve port. A pin of the disappearing type is eccentrically mounted so that it is withdrawn by movement of the handle. This handle is shown just above the machine table in Fig. 1. A simple hand operated, swinging clamp holds the cylinder firmly on the workpiece locating ring. Since contact on the cylinder head is difficult, due to the finned cooling construction, a hardened steel block, with fingers to fit between the fins for a bearing on the more solid body of the head, is made a part of the fixture design.

This special equipment delivered at a faster production than was originally calculated. Statistics on this milling job are given in Table 1.

TABLE I

Diameter of cutters	4"
Number of blades	10
Cutter speed	815 r.p.m.
Cutting speed	1050 f.p.m.
Feed	.20" per min.
Chip load per tooth	.00.0026"
Depth of cut	1/16"
Loading time	30 seconds
Cutting time	40 seconds
Unloading time	20 seconds
Total machining time	90 seconds —1½ minutes

Production:—45 pieces per hour at 100% efficiency

Another typical set-up for milling components of defense equipment is shown in Fig. 2. Articulating connecting rods for airplane radial motors are contour milled on this set-up by the use of "rise and fall" fixtures.

This machine is a standard No. 1842 Simplex. That is, it has an 18" wide table and a longitudinal travel of 42".

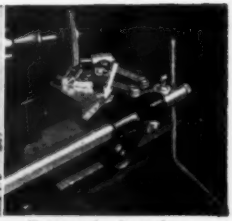
Now...Grind Threads Accurately

ON A LATHE

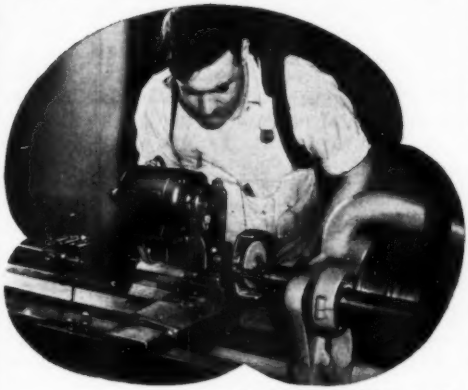
Special mounting post is furnished.

Instructions are "easy-to-follow."

Clamp wheel dresser to tail stock.



Dress wheel and you're all ready.



Equipment includes steel carrying case, special mounting post, wheel dresser, set of fine and course wheels, and wheel guard.

Here's the simple, portable, inexpensive attachment for a Dumore No. 5 Grinder that grinds threads with startling accuracy. Quickly set up and helical angle adjustment made, this revolutionary device requires no special preparation or experienced operator. It grinds threads in the same manner they are chased . . . has a foolproof wheel dresser. It's just the trick for small lot jobs that do not warrant the purchase of large and expensive thread grinding equipment . . . it prevents the delays of farming out this kind of work. There's nothing like the Dumore Thread Grinder on the market . . . it was the hit of the ASTE Show in Detroit. Ask your Dumore distributor for a demonstration right in your plant.

THE DUMORE COMPANY

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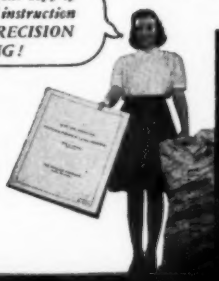

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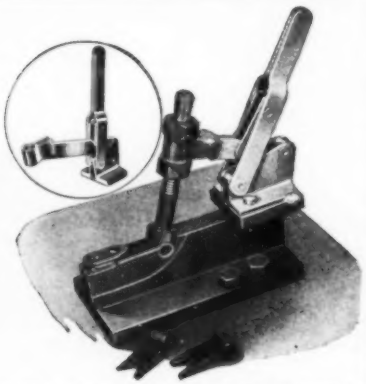

Pressed metal part held in fixture for milling operation

What Do You Require of Toggle Clamps?

To hold parts in fixtures . . . in exact position . . . during every phase of manufacture or assembly . . . for one second or one hour . . . To clamp positively . . . To release instantly . . . To reach maximum production . . . To stand up under extreme service . . . These are the functions that De-Sta-Co Toggle Clamps ably perform.

Bulletin No. 40, showing sizes and giving detailed specifications, will be sent you on request.

DETROIT STAMPING CO.
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A bed type machine is particularly adaptable to this heavy cut and large production. An automatic cycle leaves the operator free to load and unload the fixtures. The automatic cycle is effected by movable dogs on the front of the machine table, as shown in Fig. 2. The stationary bed milling machine is more rigid than the knee type with its adjustable table. Rigidity is also designed into the special fixtures and throughout the set-up. Here as in the first example, the overarms are tied solidly to the bed of the machine by the outer lacing bracket.

The fixtures are of the rise and fall type as mentioned, and each holds four rods; they are hinged at the left end and spring-loaded on the right. The contour is obtained from hardened steel master cams, one on either side of each fixture. Thus, a predetermined motion is imparted to the leaves of the fixture and, therefore, to the rods as the leaves pass over rollers located on the machine bed at each side of the table. In simpler terms, the leaf of the fixture rising and falling relative to the rollers generates the proper contour on the rod.

Four rods are placed on hardened and ground bars and then laid in the fixtures. The right end of the fixture locates the rods longitudinally from a "V". Two clamps on the right end are tightened first and then filler blocks are placed between adjacent rods. A side clamp, shown in Fig. 2, is tightened to press the rods together. The left end bar, which floats is then tightened to complete the loading operation.

The cutter for this job necessarily had to be as small in diameter and yet as rigid as possible. An arbor type cutter gives maximum strength. This type cutter is similar to a spiral slab mill except that it is solid and requires no arbor. One end of the cutter fits directly into a special adapter in the machine spindle and the other end into the arbor support.

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Sundstrand Open Line Tools sell in shops of all sizes. Included are Balancing Tools, Manual Index Bases, Bench Centers, Airport Service Equipment; unexcelled in quality, value, sales opportunities. Investigate.

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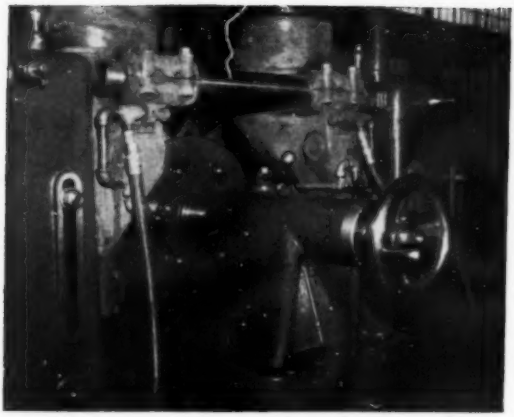

Fig. 4—Tail stock and clamping arrangement on sprocket milling machine.

Since this set-up depends upon cam motion for the correct contour, the diameter of the cutter necessarily has to be held to the required minimum. For longer cutter life between sharpenings, the distance between adjacent rods is equal to the width of cut on each rod. The quill of the machine can be moved 1¼" and a new surface of the cutter is brought into position thus doubling the time between sharpenings.

It can be seen in the picture that four coolant outlet pipes are provided, each equipped with a valve for adjustment of the coolant flow. The coolant is set to flow directly over each rod.

Conventional cutting is used for milling rods in both fixtures. Statistics on the cut and machining time are shown in Table 2.

TABLE II

Diameter of cutter	2½"
Number of teeth	6
Cutter speed	106 r.p.m.
Cutting speed	70 f.p.m.
Feed	1.8" per min.
Chip load per tooth	.003"
Depth of cut	3/32"
Width of cut	6"
Loading time	2 min. 0 sec.
Milling one side	8 min. 40 sec.
Milling other side	8 min. 40 sec.
Total machining time	19 min. 20 sec.

Production:—24.8 pieces per hour at 100% efficiency

A third and particularly interesting set-up is that shown in Figs. 3, 4, 5, and 6. This job is a typical example of the unusual operations encountered in

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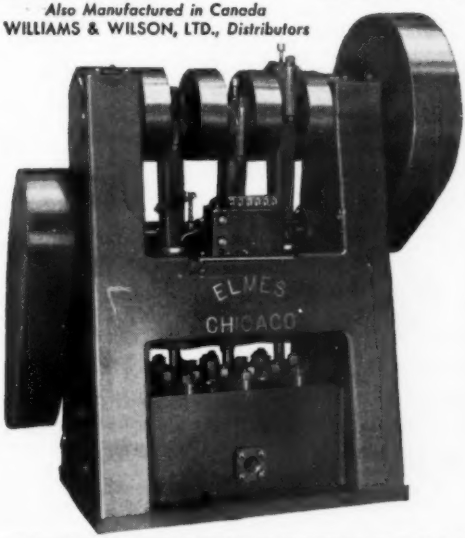

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BENTON HARBOR **MICHIGAN**

milling some of the equipment for defense mechanisms. Shown in the accompanying pictures is a set-up for milling the tooth contour on sprockets which drive the caterpillar track on the medium army tank. The sprocket is 30" in diameter with 14 teeth. The tooth contour and spacing are to be maintained accurately since these sprockets operate at high speeds.

The machine chosen for this operation is a bed-type duplex with a 22" wide table and 84" table travel. It is a very heavy, rigid machine powered by a 15 h.p. motor. Cross adjustment of the cutters is obtained by moving the entire upright in gibbed ways. This feature makes the machine especially adaptable for this particular set-up.

Special equipment includes two close-up vertical heads, a large dividing head with locating barrel integral, and a tail stock with clamping plate attached. The formed cutters are especially made of high speed steel.

Fig. 5—Close-up of center form cutter.

The vertical heads are mounted directly on the movable spindle block of the machine, thus making vertical adjustment simple to accomplish. The drive for the heads is taken directly from the machine spindle. Spiral bevel

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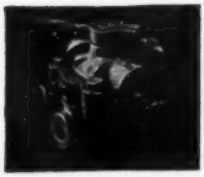

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As a result, NOPAK Control Valves for Air or Hydraulic Service eliminate the common causes of valve leakage, pressure loss, and valve failure due to excessive wear. They help you eliminate maintenance expense, costly shutdowns, in these days of full-speed production. Write for Bulletin 65.

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NOPAK VALVES and CYLINDERS
DESIGNED for AIR or HYDRAULIC SERVICE

gears and anti-friction bearings with grease lubrication are used throughout. Heavy lead flywheels are provided at the upper end of the spindles to produce added inertia which is helpful in obtaining a smooth cut and eliminating chatter. Flywheels on the machine spindle also increase the inertia effect. Further rigidity is obtained by tying the two heads together with cylindrical steel bars clamped in long bores. Bottom supports equipped with roller bearings are provided for the stub-arbors to decrease the deflection of the arbor and cutter set-up. A dust and coolant proof seal covers the bearings and keeps them clean.

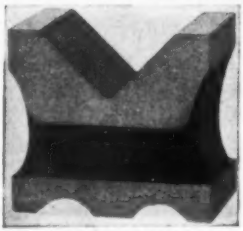
The indexing head is of heavy construction and indexing is obtained through a worm and wheel. The spindle is mounted on anti-friction bearings to increase accuracy and ease of operation. To supplement the accuracy of indexing by the operator, a spring loaded plunger and precision bored plate are mounted at the rear end of the spindle. They are shown in Fig. 4. In addition to helping the operator during indexing, this plunger serves to lock the spindles while under cut. A clamp type lock holds the spindle positively in place during the cut.

Mounted directly on the face-plate of the dividing head is a cast iron drum on which the sprockets are loaded. The sprockets are located centrally from the internal diameter on hardened steel strips which were set in the drum.

The tail stock, as shown in Fig. 4, is equipped with a face plate mounted on a large rotatable shaft. The tail stock hand-wheel brings the face plate into position at the end of the drum. Holes in the face plate allow ⅞" nuts to pass through. A slight rotation of this plate moves the studs into slots, and by tightening the nuts the sprockets are drawn firmly together.

It will be noted that the teeth are completely milled in one revolution of

"TRU-V" BLOCKS



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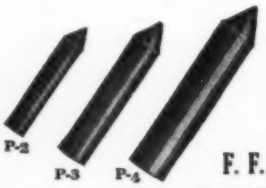
for Truing Grinding Wheels



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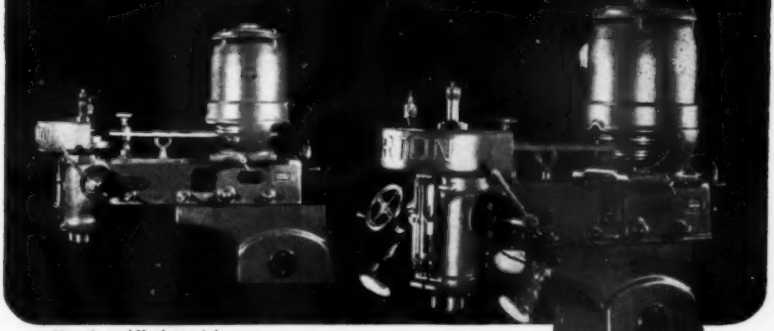
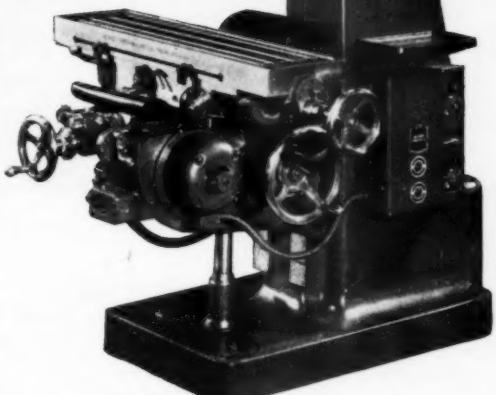


View above of Head extended

The cross range of a Gorton Super Speed Miller is more than doubled—in half a minute—through the exclusive ram movement of the spindle head. By unclamping, the head may be extended as far as 12 inches.

This one feature saves floor space, set-up time, and gives you the capacity of a larger machine . . . at small machine cost.



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MILLING MACHINES AND MILLING ATTACHMENTS.

MANUFACTURED BY
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MACHINE TOOL CO.
GLENDALE, CALIFORNIA.
U. S. A.

the sprocket. Since the difference between the smallest diameter and the largest diameter of the cutter is considerable, and to obtain a smooth finish, it is advisable to take two cuts. Since the peripheral speed is a function of the diameter, cutters on independent spindles can be operated at more nearly correct speeds.

Another consideration is the cost of the cutters. They are made up in three sections as shown in Figs. 5 and 6. If a breakage occurs, either during manufacture or while in operation, the loss is minimized. Grinding is also simplified. These cutters are eccentrically relieved so that the form does not change with successive grindings.

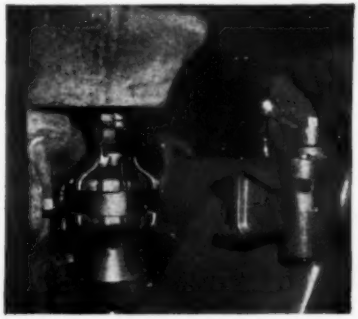

Fig. 6—Close-up of outside form cutters and swinging arm for locating bar.

The rough outline of the tooth is cut out on a band saw leaving approximately ⅛" of stock all around. To facilitate alignment of the rough teeth, a removable locating bar is provided. The swinging guide is shown in position in Fig. 6. The locating bar, lying on the machine table, is fitted into this guide and a similiar one on the dividing head face plate. When the teeth are all aligned properly with this bar, the tail stock face plate is clamped into position and the fixture is loaded ready to begin cutting.

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Increase your production capacity quickly and easily with this complete line for motorizing all **machine tools.**

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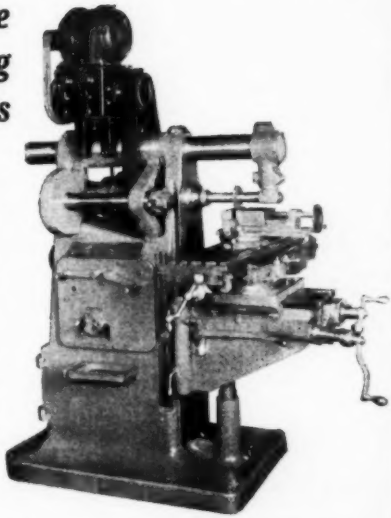

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The statistics on the production obtained from this set-up are shown in the accompanying Table 3.

TABLE III

	Simplex Head	Duplex Head
Diameter of cutters	6¼"	8½"
Number of teeth	10	10
Cutter speed	35 r.p.m.	30 r.p.m.
Cutting speed	58 f.p.m.	58 f.p.m.
Feed	2.8" per min.	
Chip load per tooth	.008"	.0093"
Depth of cut	⅛"	⅛"
Loading time	12 min.	12 min.
Cutting time	4.7 min. x 14	66 min.
Indexing time	.30 min. x 14	4.2 min.
Unloading time	5 min.	5 min.
Total machining time		87.2 min.
		1 hour, 27 min.

Production:—8 pieces per hour at 100% efficiency.

Described in detail in this article are three distinctly different types of set-ups for milling parts to be used in machines destined for the defense of our country. When it is considered that there are literally thousands of parts which must be engineered in the manner outlined here, some conception of the vastness of this undertaking can be appreciated.

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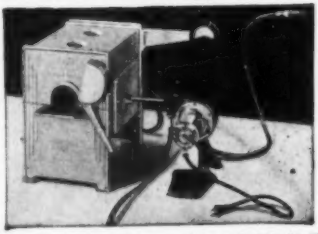

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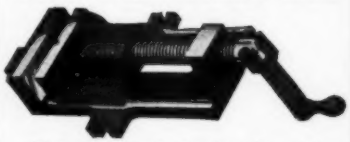

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Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
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SPREADING discomfort — sapping vitality — slowing up production. Heat-Fag does its work quietly — unseen — *whenever men sweat.* For, sweating robs the body of its normal salt balance—and, doctors tells us that lowered efficiency, fatigue, discomfort follow — even sickness or cramps in extreme cases.

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Morton's salt tablets contain the most highly refined salt, pressed into convenient tablet form, easy to take with a drink of water. They dissolve in less than 40 seconds after swallowing.

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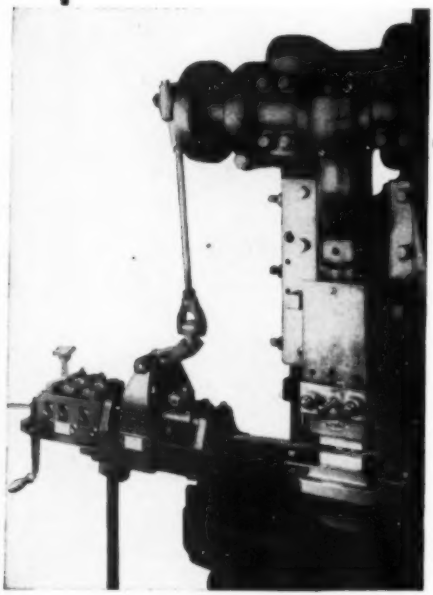

In making radio tube cathodes from .003" thick nickel a four stage progressive die is used—without pilots. To turn out a perfect cathode the length of feed must be held within ± .0005". Three U. S. Slide Feeds in this particular plant are maintaining this accuracy month after month.

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U. S. Slide Feeds are built in eight standard sizes ranging from the
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Makers of
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Standardizing Carbide Tools

AN ingenious tool control and standardization program permitting use of "standard" tools for most operations involving use of tungsten carbide has been evolved by Federal Mogul Corp.

History of the program to date indicates that it not only simplifies tooling problems and permits a wider use of tungsten carbide tools, but that it will also result in considerable economies in the way of reducing tool costs and stocks.

The fundamental principle under which the plan operates is to use "standard" Carboloy tools almost exclusively, such special tool shapes as are required being obtained largely by re-grinding the standards tools to the shapes desired. Similarly, forming tools are built up from a combination of standard tools, using a form of tool holder developed by Federal Mogul for this purpose.

Prior to the program, cemented carbide tools were largely special in character, the cost involved in such specialized designs mitigating to some extent against their wider usage in the plant. As a result, most of the tools, used previously, were of high speed steel.

Another factor previously effective in limiting the extent to which carbide tools were used was the absence of specialized grinding equipment. These were sent back to the manufacturer for sharpening under the previous set-up. With the new control program and the wider usage of carbides, special grinding equipment has been installed in a centralized grinding department, and operated by specially trained operators.

The first step toward standardization was to adopt a series of tools which were standard except as to over-

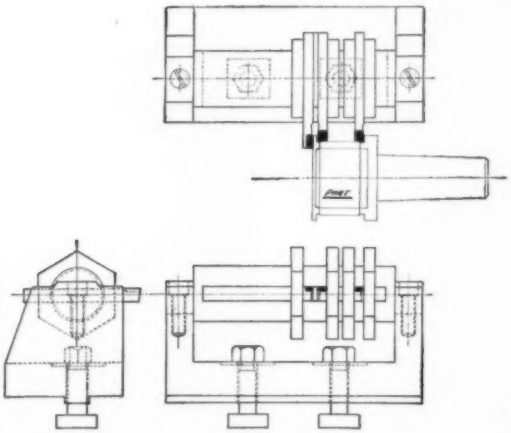

Fig. 1—Conventional type of tool holder formerly used at Federal Mogul, wherein form tools were held in position by nuts on a threaded arbor. Design limited types of tools and arrangements which could be used.

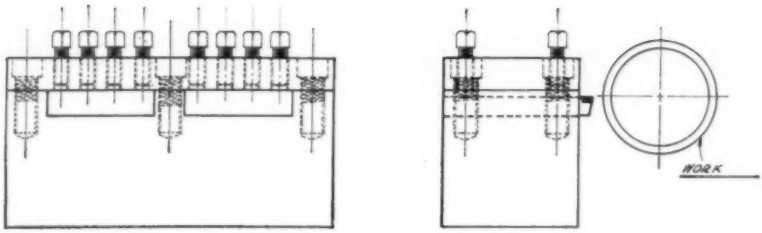

Fig. 2—New type of "Universal" form tool holder permits placement of bits at any desired angle, with greater rigidity and ease of assembly.

all length. Such tools were required in the tool holders then in use. However, it was soon found that neither tool nor holder was sufficiently rigid to take full advantage of the ability of the tool. The holder consisted of a slotted arbor, the outside of which was threaded for a series of lock nuts used to hold the cutting tools in proper position. (Fig. 1) A form cutter thus consisted of a number of these single bits ground and located to provide the necessary cutting faces in proper positions. The arbor was mounted in the holder, and the latter in turn, mounted in the usual way on the lathe or other machine tool. Various holders were slotted for several sizes of bits, one of the most used sizes being $\frac{3}{8}$ x $\frac{3}{8}$".

Accordingly a new and simplified type of tool holder was developed. (Fig. 2) This consisted merely of a steel block with a hold-down bar to retain the tools in position. The width of the block was sufficient to provide ample support for the bit just back of the cutting edge. The bits can be set at any angle and clamped in position. A center support for the clamp provides additional means of holding bits tightly in the holder.

With this improved holder it was much easier and less expensive to assemble form-tool units from standard

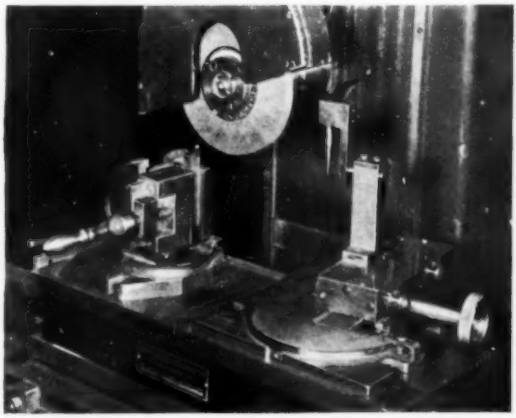

Fig. 3—Included in equipment for grinding Carboloy tools in the Federal Mogul plant is this Blanchard surface grinder with magnetic chuck and special attachment for form-tool grinding. Attachment at right is used to check radii and angles of form tools.

tools. Special lengths were no longer required. The problem of grinding tools to desired form also was simplified.

The next and most important step in the standard tool program was to do all carbide tool grinding within the plant. (Fig. 3) This was for a dual purpose. Delays could be minimized and "ready" stocks of tools, either single or made up into form-tool units, could be kept on hand to avoid grinding delay. Whenever a new or special form-tool was needed, it could then be made up almost immediately. Only a few hours are now required to produce any desired tool.

The "line" of standard tools now used consists of ½ x ½, ⅜ x ⅜, ⅝ x ⅝ and ⅝ x 1¼" for heavier work. A few 5/16 x 5/16" sizes are used, as are some 1 x 1 x 6" lengths. All are standard. Carboloy Grade 883 is used in most cases, although a few tools are Grade 44A. The 44A grade is used for interrupted cuts, the tools requiring somewhat more frequent sharpening than the Grade 883, it is stated.

Although 30 to 40 of each of the tools used under the old method of operation are still on hand, it has been possible to save from ½ to 2/3 the tool cost by using the standard tools for regular and form-tool purposes. Practically all (97 per cent) of the form tools now used are made up from square nose standard tools.

Carbide tools have also proved their value in increasing production on alloy steels. Only for cutting carbon steels such as SAE 1010, etc. is high-speed steel now regularly used.

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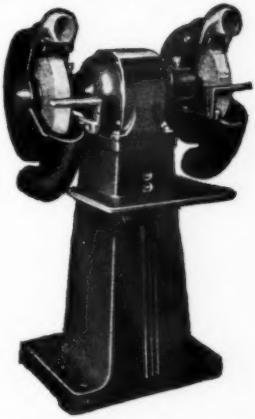

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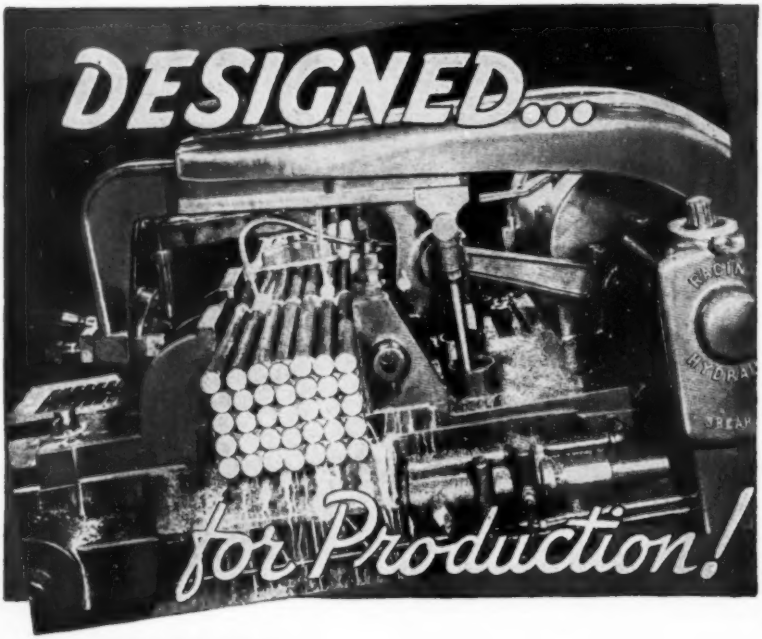

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Key Facts About Keys

By H. F. WILLIAMS

THE failure of driving keys for pulleys, gears, cams or other various types of wheels usually causes an endless amount of trouble. Many times the key so mutilates the keyseat in the shaft, or the keyway in the driven member, that it is well-nigh impossible to disassemble the parts. Obviously, the way to overcome key failure is to adopt the use of multiple splines cut integrally with the shaft. Unfortunately in many instances, this is impossible for several reasons. Firstly, the equipment in machinery, tools and gauges is not available. Secondly, the cost would be too great to justify the use of such a design. Thirdly, many installations do not require such a complicated means of driving because of low torque requirements.

One of the most common types of driving media is the square key. However, there are some objections to the use of this key, especially if it is not fitted properly. To fit a square key correctly, it should be driven into both the shaft and wheel simultaneously at assembly so that the key will have a bearing, not only on the driving and driven sides, but at the bottom and top of the keyways as well.

If the key is loosely fitted, the condition exists as shown in Fig. 1. In this case the direction of rotation is clockwise. The key is loose in the shaft and has a bearing on the left only. In the driven member, the bearing is at the right. When a load is placed on the key, it tilts or rolls in both keyways and assumes a position as illustrated in Fig. 2. After constant or intermittent rotation, the corners of the key are battered over because all the load comes upon these edges. This causes a further rolling action and accelerates failure of the key.

One way to overcome the rolling action of a square key under load is shown in Fig. 3. Here the hub of the driven member has a tapped hole to accomodate some form of set screw. When assembling, the key is pressed

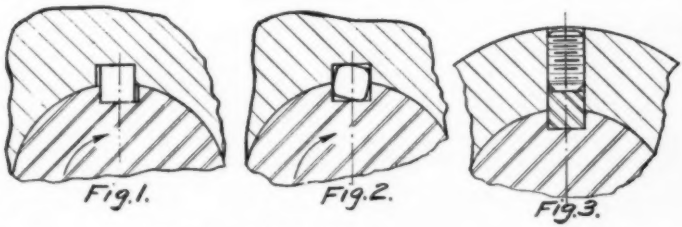

Fig.1. Fig.2. Fig.3.

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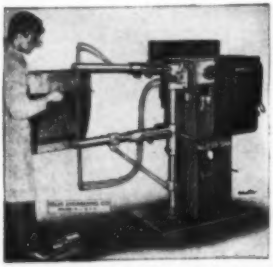

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into the shaft, the width of the key being 0.002″ greater than that of the keyseat. The keyway in the wheel has a freedom of 0.002″. When assembling, the set screw bears against the key from above. If, by careless fitting, the key should be loose in the keyseat, the screw, when tightened, prevents the rolling action. If the key is of some length, a screw at both ends of the wheel hub may be required. The keyway in the wheel may be made 0.010 to 0.015″ deeper than the key protrudes out of the shaft and the wheel assembled with a neat or light press fit on the shaft. In some installations, a set screw is also placed at right angles to the key in such a position as to pull the correct side of the keyway wall of the wheel against the driving side of the key. This correct side, of course, depends upon the direction of rotation and whether the shaft or the wheel is the driving member.

To eliminate the possibility of rolling action in key arrangements, it should be of common knowledge to the average machinist and draftsman that this may be accomplished by the use of Woodruff keys. These keys are circular segments, the height of which is slightly less than the radius, especially in the smaller sizes of keys. A feature of this type of key, aside from the non-rolling characteristic, is the simplicity with which the keyseat can be machined. Regardless of whether the shaft is straight or tapered where the wheel is assembled, all that is necessary is to sink a cutter of proper size and width into the shaft, using a plunge cut only, without longitudinal feed. Usually this key is fitted with tolerances as explained before, i. e., tight in the shaft and slightly free in the wheel. When the shaft is tapered, the key can be fitted somewhat more loosely, whereby the top of the key assumes the same angle of taper when the wheel is driven home on the shaft.

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use of Woodruff keys as illustrated in Fig. 4. A straight shaft is keyseated in the usual manner. The reamed hole in the wheel has a keyway cut at an angle to the shaft axis. The key is fitted with only a snug fit so that it can rock sufficiently when the wheel is assembled, to adjust itself to the wheel keyway. A nut and washer lock the wheel in place by wedging the top of the keyway in the wheel against the top of the key in the shaft. In this arrangement, a shaft shoulder or collars are not necessary. Although more than half the width of the key protrudes from the shaft at one end, still the same length of key engagement remains.

Sometimes two keyways are used, one next to the other when driving loads require such. Woodruff keys are easily removed. By tapping lightly at one end, the key rocks in its seat enough so that a sufficient portion of the key protrudes above the shaft to grip it in a vise. These keys are available both soft and heat-treated, the use of either depending upon the duty imposed. Because of the depth of engagement with the shaft, even though the key has but a hand press fit, the rolling action, so commonly encountered in the use of the square key, under similar conditions, is eliminated to a great extent.

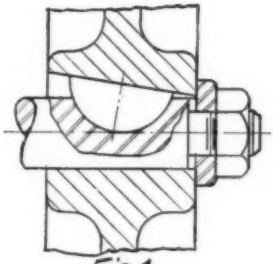

Fig. 4.

Fig. 5.

Fig. 6.

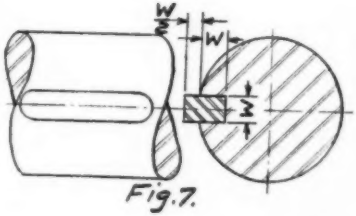

Fig. 7.

A modified type of Woodruff key is available for which anti-rolling and also anti-rocking characteristics are

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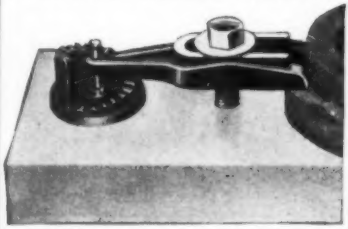

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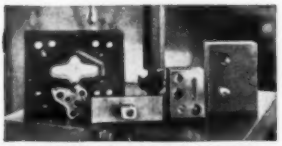

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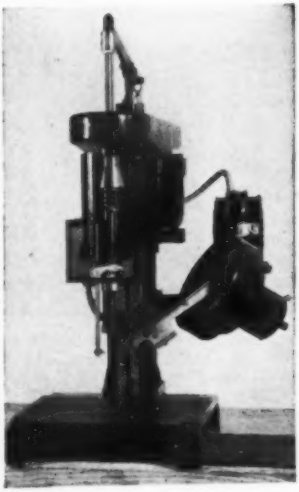

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claimed, the latter condition being impossible in a loosely fitted Woodruff key. The same system of Woodruff key cutters can be used and the keys are interchangeable if length of bearing permits. Instead of being a circular segment, the key has a short shoulder at either end as shown in Fig. 5. Another feature of this key is that if the keyseat is cut too deeply, when ordinarily a Woodruff key would lose height of contact, these shoulders prevent the key from being pressed into the shaft too far. Conversely, if the cutter is not sunk deeply enough into the shaft, the openings between the key shoulders and shaft reveal the fact.

In Fig. 6, the use of two keys is shown aligned in the same plane. A space between the ends of the keys is not necessary as would be when assembling two Woodruff keys in line because of the extended shoulders butting together. If it becomes necessary to remove these keys, a chisel or other flat pointed tool can be driven under one of the shoulders and the key pried out. The keyseat is not mutilated as is sometimes the case when square keys are used.

Probably the nearest approach to a spline is the use of the spline key, more commonly known as the feather key. Originally it was developed by the Pratt & Whitney Co., some 30 years ago. At that time a machine was made to sink these keyways by use of a fish-tail cutter or two-lipped end mill rotating at high speed with light feed both longitudinally and axially. Because of the shape of slot, this key has rounded ends and is mostly used in closed-end keyways. However it can be used in keyways with one end open, especially when thrust is only in one direction. The proportions of the key are as 1 is to 1½. That is, the height is 1½ times the width. The key is sunk into the shaft once its width, the re-

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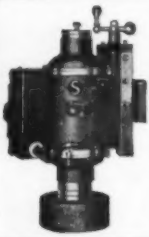

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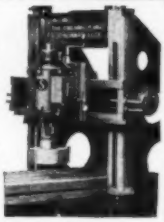

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mainder or ½ the width protruding from the shaft. Usually it is fitted with 0.001 to 0.002″ press fit and in closed end keyways has a bearing on both sides and at both ends as well, as shown in Fig. 7.

When quantities of these keys are used, stock is available in long lengths of drawn steel to the width and length desired. All that is necessary is to cut off to the required height of the key. When calculating for the correct effective length of key necessary, it is obvious from Fig. 8 that one width of the key must be deducted from the overall length. Because this portion is lost in every instance, fitting of the key can be made easier by slabbing off each side of the radiused ends approximately 30 degrees from the center of the radius as shown in Fig. 8. This leaves but a short portion of rounded end to be dressed off when fitting the key into the slot. It is therefore logical to assume that drawn key-stock could be made to such a shape to eliminate the extra milling operation.

Sometimes such keys are made by form milling a half round on each end, especially when keys used are either too long or too short to warrant the use of special drawn shapes. In this case, steel of the proper rectangular size is cut off squarely, ends slabbed off and rounded by hand with a radius ¼ of the width to give butt line contact at the extremities of the keyway as shown in Fig. 9.

Some machinists prefer, either by choice or necessity, to cut the slot on a vertical milling machine. If the slot is long, others use a circular milling cutter to "hog-out" the most of the slot and then use an end mill to dress out the ends, in any case, it will be found advantageous to dress off the lower edge of the key contacting the bottom of the seat with a file to the shape as in Fig. 10. This is because the cutter does not retain a perfectly sharp corner. The key therefore would have but a two edge contact at the bottom of the groove. The chamfered edges allow the key to seat properly at the bottom of the keyway.

It is sometimes desirable to fasten the

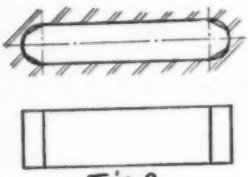

Fig. 8.

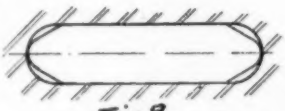

Fig. 9.

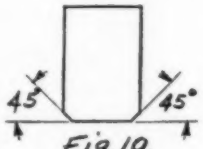

Fig. 10.

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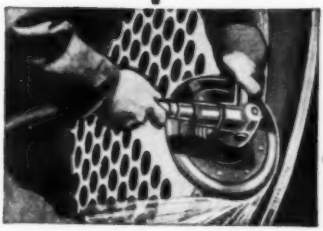

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key permanently with either one or two fillister head cap screws, depending upon length as shown in Fig. 11. This construction is often used when the fit is not so snug as it might be, especially on long keys that are used for sliding gears. Because they are too hard to assemble, long keys have not the press fit tolerance of the shorter keys. When used, for instance, in a gear box, these keys would have a tendency to work loose, thereby impairing the sliding of gears. Therefore the advisability of fastening. Feather keys used in open end keyways are sometimes pinned against thrust as well as screwed fast.

When it is necessary to disassemble a feather key, several methods can be used. The first is by catching the protruding part of a key in a brass or copper jawed vise and pounding against the shaft with a babbitt hammer. A better way is shown in Fig. 12. One or two holes are tapped into the key before assembling. When the key is to be removed screws are inserted into the tapped holes and screwed against the bottom of the key seat. If done simultaneously the key will be jacked out of its seat quite readily. In Fig. 13 an exaggerated view shows how two feather keys are used for sliding gears in a machine tool gear box. Because of selective assembly, the sides of the keys are to be ground after assembling the key with the shaft. The splines are milled approximately 180 degrees apart and slightly wider than the finished key. They are then ground in an accurate index fixture for perfect alignment and a fit on the shaft.

The last type of key to be dealt with in this article is the dovetail key, illustrated in Fig. 13. The height and width at the large end have approximately the same dimensions. Both sides of the dovetail have a 10 degree angle. The key, when assembled, has a snug to

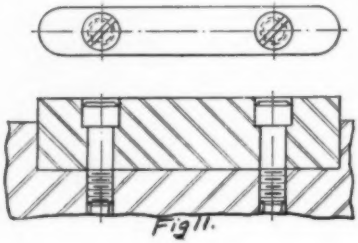


Fig 11.

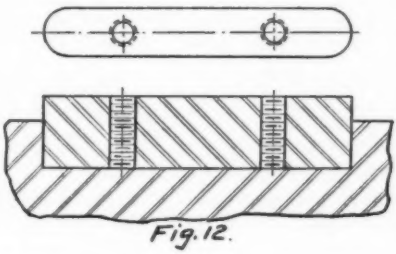
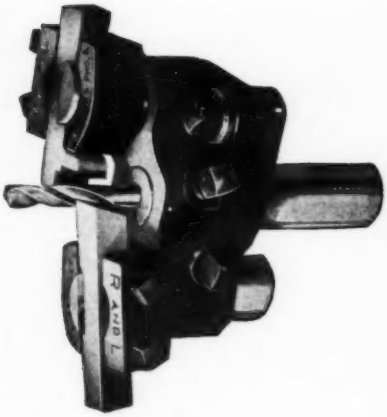


Fig. 12.



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Some of the multiple operations that can be done with the R and L are: Pointing work concentric with turned diameter; drilling and chamfering; turning and forming special shape or end of part while drilling or reaming; turning one diameter — chamfering two corners, facing end of part along with drilling or reaming; turning two diameters while drilling or reaming; turning shoulder concentric with stock diameter.

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press fit in the tapered keyseat. In the sketch, the key has a sliding fit in the shaft, there being clearance between the key and the shaft keyway. When this keyway is cut deeply enough, the corners of the keyway can be radiused. This is especially advantageous in a heat treated shaft in which these rounded corners prevent fracture during heat treatment.

As in the square, Woodruff and spline keys, the depth of engagement is proportioned the same, viz., half the width at the engaging or lower end of the key. As shown, the shaft is slidable in the outer member while also rotating.

The procedure may be reversed in that the key can be pressed in the shaft. It can be used either singly or in multiple and in this latter instance acts as a multiple spline. When used

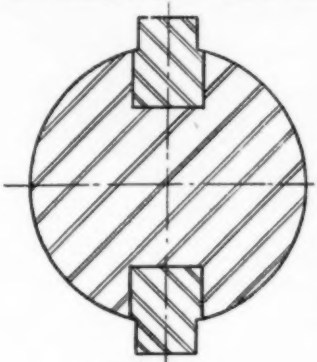

Fig. 13.

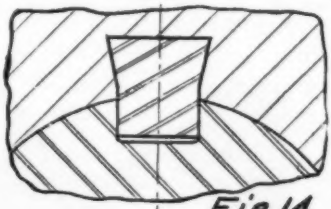

Fig. 14.

in multiplicity it is, of course, understood that machining tolerances are difficult to maintain. Probably the best feature of this type of key is the fact that it withstands the tipping or rolling action better than a square key in that the effective width at the large end of the taper is greater than the part that contacts the mating member.

Another point to bear in mind is the fit of tapered bores on tapered shaft ends. Where this fit is accurate it will help to prevent shearing of keys.

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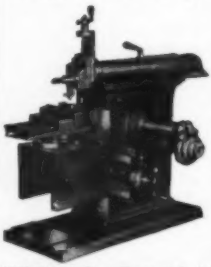

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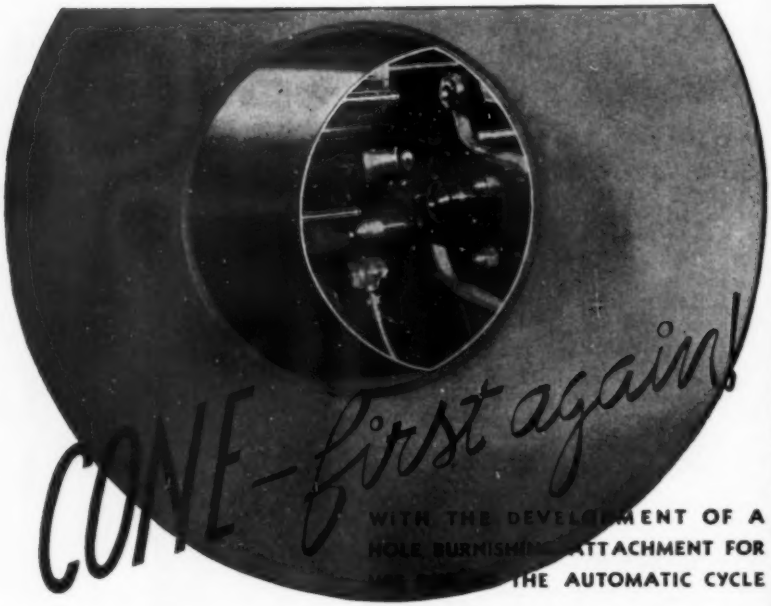

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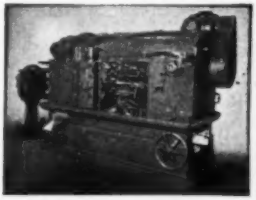

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"Let's Talk Shop!"

Welding Positioner Table

By John S. Green

To successfully compete in fabricating the wide variety of jobs that are called for, the small jobbing shop must rely on imagination and ingenuity instead of capital investment for special and sometimes intricate tooling.

The illustration shows the principle of a Revolving-Tilting Welding Positioner Table that can be built and used in the most modest jobbing shop. The Positioner pictured was built when it became necessary to improve welding procedure in the fabrication of flanged pipe nozzles for pressure vessels.

After investigating the conventional type of Positioners, it was decided to build an experimental machine in our own shop.

The answer to the question of locating a satisfactory and cheap mechanism for the revolving member of the Table was found in the suggestion that we use the front axle and wheel assembly of discarded automobile trucks. A trip to a graveyard of defunct automobiles disclosed an unlimited supply of such wheel assemblies that could be purchased at $1.50 each.

With one of these wheel assemblies as a basis for design, it took but a short time to sketch the required Tilting and Revolving Positioner, that could be rotated easily with loads up to 1000 pounds.

When sketch of Positioner was sent to the Welding Shop, it was found that only the following material was required to be taken from stores material:

1 Steel Base Plate	1x34" Diameter
1 Steel Table Top	½x36" Diameter
1 Coil Spring	⅛ Wire 10" long
1 Steel Yoke Plate	¾x12x16"

Balance of the material required was found in steel scrap bins.

A little description of the photograph is required: — A pin which registers with holes in the yoke, controlled by a foot lever, gives the required angle at which to set the table; — a pressure plate controlled by spring through levers to the foot lever gives the operator full control of revolving the work as required—table was drilled for suitable clamps to hold work in position.

Cost of one Positioner:

Material	$17.73
Productive Labor (16x.90)	14.40
Total	$32.13

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made to build a Welding Positioner, the experimental one was completed and in service.

This same type of Positioner is now being redesigned for use in the fabrication of an order for web and spoke Wheels (16″ and 20″ diameter) to be used in the Defense program. About 10 of these Positioners will be required on which to weld spokes and webs in the wheels as they are taken from the set-up fixtures. On this job a power driven table would be of no advantage as spokes interfere with welding a continuous bead.

(Photo, Courtesy Hobart Brothers Co., Troy, O.)

Detecting Cracks in Metal

By Frank V. Faulhaber

The exacting mechanic is ever on the alert for cracks in machinery and other metal parts, particularly those under stress. Oftentimes these cracks are invisible to the eye, even on close inspection. However small, these cracks sometimes lead to serious breaks and accidents. In the case of machinery under manufacture, it is desirable that the product reach the buyer in A-1 condition. As respects the worker's tools, it sometimes behooves the user to determine whether these are strong enough. In the interests of safety, shop operatives cannot be too careful.

Whenever metal parts are under suspicion and the mechanic desires to probe further for possible cracks, detection can be aided in a number of ways. First, the metal surface should be thoroughly cleaned. One means is to swab the entire section with machine oil, allowing this to dry for a few minutes, then wiping dry. After this, a coating of chalk can be rubbed on with a cloth. Any crack present will be revealed by the stain on the chalk caused by oil seeping from the crack. This test can be facilitated or expedited by a slight tapping with a hammer, the vibration causing the coating to crack if there is a crack in the metal.

Another procedure is to apply a coating of petroleum on the suspected part, then rubbing it off with a dry cloth. When the metal surface is completely dry and clean, it should be rubbed over again, this time with some chalk placed on the cloth. Any crack in the metal

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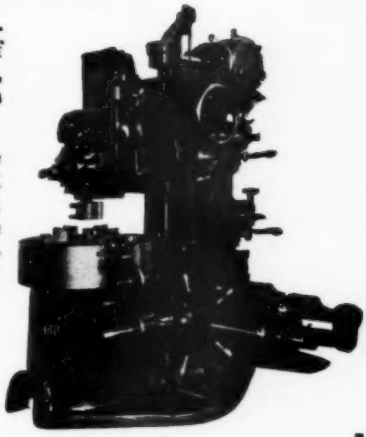

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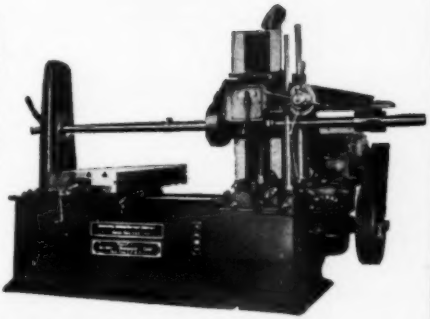

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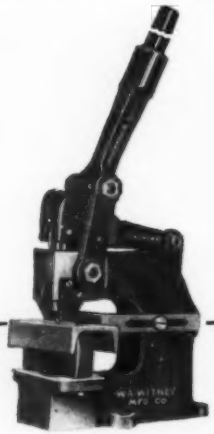

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will show up, traced by the petroleum coming out when the chalk is rubbed over it.

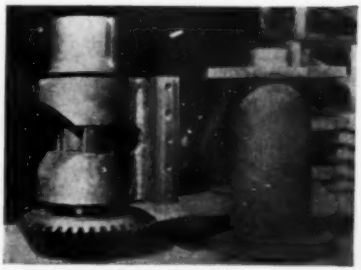
Another method is to prepare a mixture of whiting and water, reducing to the consistency of a thin cream. After initially cleaning the questioned metal, a coating of this material is applied, permitting it to dry. The whiting will absorb enough oil along the crack to discolor it slightly at the edges.

Equally proved is a thin mixture of gasoline and red lead. Following surface cleaning, the metal is given a coating of this preparation. After a few minutes the gasoline evaporates. Then the suspected area is gone over with a clean rag, removing the lead. In this case, if there is a crack present, the suspicion will be attested by a thin vein of red lead observable. This red lead remains in the crack after evaporation of the gasoline and removal of the surface coating.

When conducting tests of this kind, the use of a magnifying glass will be helpful.

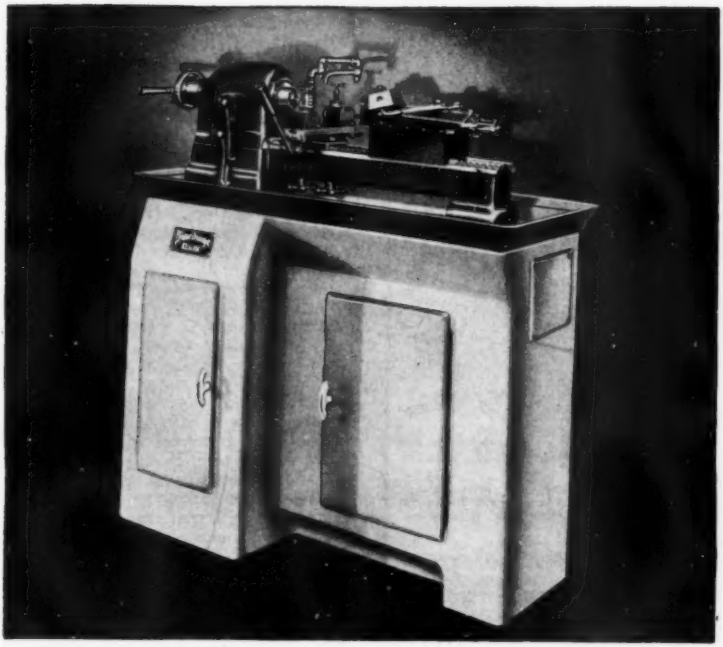
Welding Simplifies Fabrication

The illustration shows the sturdy parts of a flanging machine manufactured by the Blue Valley Machine & Mfg. Co., Kansas City, Mo. This, according to the manufacturer, is convincing proof of what can be accomplished by electric arc welding which fuses steel parts together and deposits the smooth bead joining the two round shapes to the square plate comprising the base.



Supplied by The Lincoln Electric Co., Cleveland, Ohio, the photo shows, (at

Elgin



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left) the main drive housing of the flanging machine. The base is 16 x 16 x 2-½" thick. Welded to the base are two bearing housings cut from 5" plate 10-⅛" in diameter, with spacers cut from square bar stock and welded in position.

At the right is the main hydraulic cylinder for the same flanging machine. This cylinder is made from seamless steel tubing 8-½" in diameter by 19" in height, the head and base both welded.

The Lincoln correspondent says that the low manufacturing cost of this flanging machine permitted by arc welding makes it possible for practically any plant or shop to own and operate flanging equipment.

Double Shrinkage

By M. G. Heuer

With the speed required in production work today, factories are often hard put to it to find short cuts. As soon as a job has been released from the Engineering and Designing Departments and goes into production, pressure is usually applied to get the jobs out as soon as possible.

When jobs are in an experimental stage at a well-known tractor maker's plant, the Pattern Dept. has made a practice of getting permission from the Engineering and Designing Departments to make the patterns "double shrinkage." Then, if the patterns prove satisfactory in design and dimensions, these patterns, with a little added where additional stock is needed for finishing the metal patterns, may be used as masters in procuring the metal production patterns.

This practice has made it possible for the Pattern Department to save considerable time on many important jobs. It has eliminated the need for building patterns from the ground up.

When single shrinkage is used on experimental patterns, the wood patterns are put in the storage room or vault and are good for nothing except occasional reference. The masters are always available, but if a little extra stock is allowed for cleaning up the

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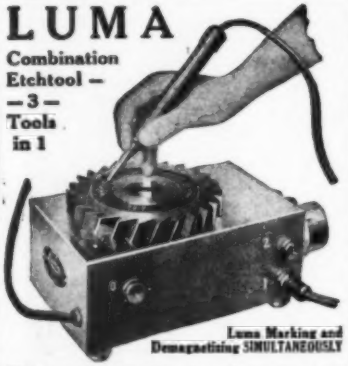

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surface and a little is added where the pattern must be finished, the master can be used for making metal production equipment.

"We still make simple jobs single shrinkage," the pattern foreman pointed out. "We never go ahead on double shrinkage without special permission from the Designer or Engineer. This permission is very important to avoid misunderstandings later. We have, however, always found that it works out satisfactorily."

Of course, the malleable jobs are made in bronze or steel for a tryout. On these it is entirely satisfactory to allow the ¼" (the amount of shrinkage per foot) because that permits the 1/3" per foot reduction of size to the standard required for malleable castings. On cast iron, if double shrinkage is allowed, it is important to get the consent of the Engineering Department to make the experimental castings "one shrinkage" larger whenever possible.

Marking Brass

By Theodore Oshinsky

Machinists are aware of the difficulty of marking revolving brass on a lathe with a piece of chalk. In trueing-up brass rods the average mechanic uses the tip of the chalk for marking the "high-spots" which, however, is not always effective because the smooth, polished surface of the chalk will not adhere.

For better results, rub the chalk at the tip, on a piece of sandpaper until the point resembles a chisel. The sharp edge will always put a ring around the smooth brass surface.

Oilstone Files

An attractive folder has been issued by Behr-Manning Corp., Troy, N. Y., devoted to India and Arkansas Oilstone Files, both of which fill a very important place in industry today. As the different shapes are very important to the user, they have endeavored to portray the stones accurately.

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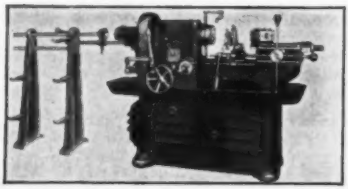

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Another Application
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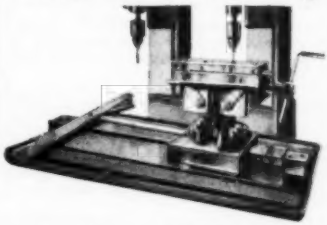
"JOHNS" Drill Jigs



This view shows a **"JOHNS"** Drill Jig with carriage equipment for multiple cross hole drilling on shafts. One of the many ways these jigs can be used.

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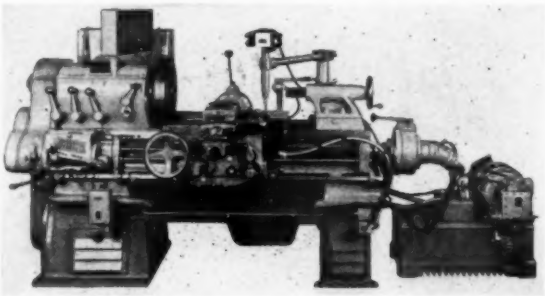
upon precision fits for full production that oilstones are filling a very important need. Tool and die makers find them especially valuable in developing new models where accuracy often demands the removal of small amounts of metal without roughness or scratching.

Speeding Aircraft Work

A new, dual duplicating control attachment for use with almost any machine tool, is now being used to speed aircraft production turning operation. It is said to eliminate the necessity for specially skilled help by providing automatic control over an 180° included angle.



The control attachment can be disconnected and the lathe used for regular turning operations. Moreover, the semi-automatic control permits the lathe to be used by comparatively unskilled help on relatively intricate work.

While similar in design to the standard, single control which is used largely for die and mold duplicating, the new dual unit has duplicate solenoids, pumps, hydraulic motors, tracer contacts, etc. Two separate hydraulic heads actuate cross and longitudinal feeds, each with a de-clutching lever,

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A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

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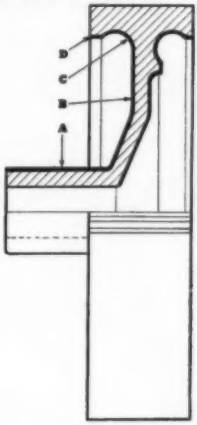
to permit change-over from automatic to manual control. A simplifed push-button control board, mounted on head of lathe permits selection of speeds, etc., for lathe and duplicating control. The tracer unit mounted on lathe bed and positioned to follow outline of a template fixed to the cross slide, has two sets of contacts to control either solenoid as required. A solenoid operated clutch, mounted in the gear train, is claimed to permit steep walled cuts at high speeds without digging in or gouging.

Example of the type of work to be done by the two engine lathes, which were manufactured by Reed Prentice Corp., and converted for automatic operation by the Detroit Universal Duplicator Co., is the production turning of an aircraft engine part—a sketch of which is shown.



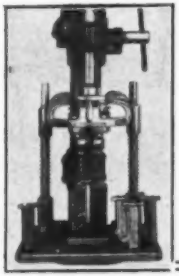
The more important requirements and conditions that are said to have necessitated the semi-automatic control to insure delivery according to specifications are: — High speed production; intricately shaped, thin walled work which does not lend itself to forming tool work; limits of 0.010"; possibility of use of semi-skilled help.

With the equipment as described it is expected that output per machine will approximate 40 pieces per day per lathe.

LINCO *Two Spindle* Adjustable Drill Head

Also Adaptable for Tapping

Drills two holes at once, made in several sizes, drill centers ½" to 6", speeds up to 3600 RPM, capacity drills 0" to 5/8". Total weight of small head, with aluminum gear case, only 9½ lbs. Equipped with roller and ball thrust bearings. Especially engineered for Canedy Otto, Demco No. 15 and similar drill presses—also suitable for use on larger drill presses.



Descriptive Bulletin
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Machine & Tool Co.
12253 Coyle Ave.
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We can furnish Hydraulic Presses and Accessory Pumps and Accumulators of all sizes and tonnages (from 5 ton to 2000 ton capacity) from our huge stocks of machinery located in our Trenton N. J., Boston, Mass., Akron, Ohio and Los Angeles, Cal., Warehouses. *Write for further information.* We have served the Rubber and the Plastic Industries for 50 years.

L. ALBERT & SON **TRENTON N. J., AKRON, O., LOS ANGELES, CAL.**

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Here is a brand new tool which will cut down set-up time and help speed up your production.

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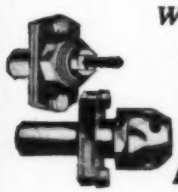
RELEASING MODEL
TAP HOLDER

Production is at a standstill while your hand screw machines and turret lathes are being set up for a job. Any saving in set-up time means more production hours per machine.

Since ALCO Tap Holders hold taps firmly *without the use of bushings,* no time is lost in making or searching for bushings. Just insert the tap, tighten the nut, and GO!

The most rigid drive ever used on a releasing type tap holder which can cut either right hand or left hand threads without any adjustments whatsoever. The elimination of pins in the drive results in greater rigidity—another step toward better production.



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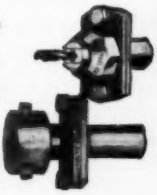

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MASTER MODEL 2
ONLY $16.50

At this high speed, Dremel MOTO-TOOL reduces cost of wheels, points, etc., on grinding, buffing, finishing and other daily shop operations. An indispensable tool for pattern shops, tool rooms and production departments. Ideal for exacting work in hard-to-get-at places . . . often saves time of tearing down and re-setting dies. Pays for itself on first job in many cases.

MOTO-TOOL is precision built for precision work. Has full bakelite shock-proof housing, oil-less (oil-sealed) bearings and built-in cooling fan. Weighs only 13 oz. Balanced armature eliminates vibration. Operates on either AC or DC 110-12 volt current. Sold by better dealers everywhere. Write for Dremel catalog and combination offers.

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DON'T LET RIVETING HOLD UP PRODUCTION

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The Grant Mfg. & Machine Co.
C. E. STATION, BRIDGEPORT, CONN.

Eliminating Machine Static

By Theodore Oshinsly

Production Foremen will be interested to learn that Christmas tree tinsel has other important uses aside from decoration.

One of the characteristics of tinsel is its static electrical conductivity which can be applied to eliminating static from cutting-off knives, creasers, or at any section of machines where static is generated.

To apply the tinsel at the troublesome point, merely cut off the necessary length of tinsel roping and fasten one end around the head of an available screw or nut, allowing the free end to brush against the moving body. This method will remove and ground the static.

Advancing the Welding Art

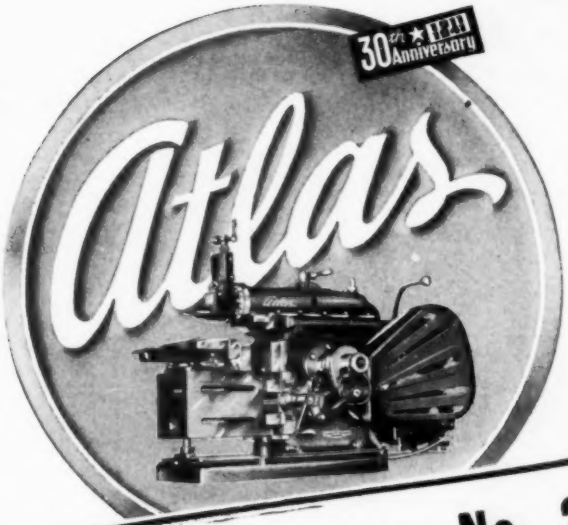
Summerill Tubing Co., Bridgeport, Pa., announces establishment of a series of prizes for papers to advance the art of welding of air-craft steels including tubing and other steel parts for tubular assemblies.

In this connection it is pointed out that papers submitted in the Summerill contest will also be eligible in the $200,000 Industrial Progress Award Program which is being sponsored by the James F. Lincoln Arc Welding Foundation, provided of course, such papers comply with the Foundation's Rules and Conditions as regard subject matter and form.

It is conceivable that a paper entered in the Summerill contest could be written in such a way as to be acceptable in the Lincoln Program. If it is not acceptable as written, the author, by a few changes or additions, could make it conform to the Foundation requirements. Eligibility of papers in the two projects should provide added stimulus to the study of welding in the aircraft field.

Niagara Squaring Shears

Bulletin 72-B describing their power squaring shears is announced by the Niagara Machine & Tool Works, Buffalo, N. Y. These machines are offered in capacities ranging from 10 gauge to ½".



Defense Lesson No. 2

Time and money can be saved by using large machines on large operations *only*—delivering all small work to the compact thoroughly dependable Atlas Machine Tools.

The lessons learned in defense production with Atlas Equipment will help recapture profitable markets when war needs are fully supplied.

ATLAS PRESS COMPANY
650 N. Pitcher St.
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Hold SMALL Work SECURELY

with this

Handy Drill Jig

Self contained and well built. Quick to change for length and diameter, for both shoulder work and gauging from the end. Chips fall away from gauging parts.

A. S. A. Standard bushings with liners to drill any size hole up to ¼" diameter. One bushing furnished with Jig. V block to center work. Can be made any form for holding special pieces. Locking handle can be reversed for either hand.

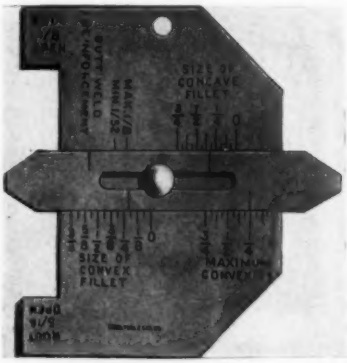
Let us send you more information.

RACINE SCREW WORKS

RACINE WISCONSIN

Handy Welding Gauge

Welders, inspectors, and other men concerned with the calibration of butt and fillet type welds will be interested in a handy pocket welding gauge just developed.



This useful device is reported to provide a ready means of determining the size of a convex fillet weld. Its shape also makes it suitable for other functions, such as checking the permissible tolerance of convexity of a fillet weld, determining the size of a concave fillet weld, and checking the permissible tolerance of reinforcement.

Further information on this gauge may be obtained from the Chicago Tool & Engineering Co., 8365 South Chicago Ave., Chicago, Ill.

Early Profile Sawing

An interesting example of early die-cutting technique is explained in an old catalog dug up from files of The Henry G. Thompson & Son Co., New Haven, Conn., manufacturers of the Milford Profile Saw.

In a letter dated April 21, 1896, Geo. M. Griswold, a New Haven toolmaker, writes:—"It gives me pleasure to report the first trial of your jig saw on die work, viz:—I had two blanking dies to make the same size, one right and one left hand. I gave one to my die-maker to drill, chip and file out, which took him six hours. I sawed out the other

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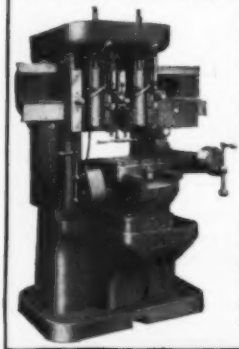
MOREY No. 12M
Vertical Profiler & Milling Machine
For Economical Accurate Duplicate of Small Parts



MOREY has designed this machine for the manufacture of small parts requiring accurate interchangeability. Many new and exclusive features make it "tops".

Let us send you our latest circular No. 680, giving all the detailed specifications of this time and money saving machine.

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SPECIAL HEAVY DUTY
110 V—220 V—440 V
DEMAGNETIZERS
SIZES UP TO 18"x24"
Send For New Prices and Specifications
R. B. ANNIS COMPANY
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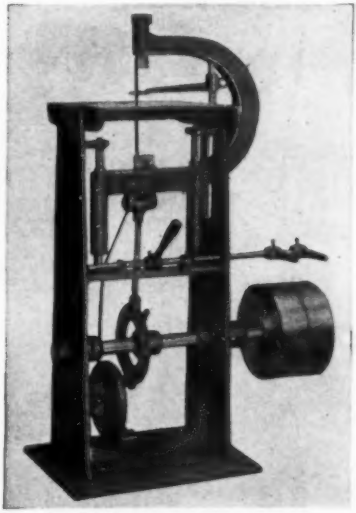
on your jig saw; time one and three-quarters hours".

The stock was ½" tool steel. The saw was coiled in a 50' magazine at the base of the machine and could be drawn through as required.



Although metal-cutting band saws were in use at that early date, this jig saw evidently was the true forerunner of the modern profile sawing machine in that it was able to saw to a curved line. Electric welding of the very narrow, metal-cutting band saw on the machine was apparently all that stood in the way of present widespread use of profile and contour saws.

Fellows Flame Hardener Brochure

An automatic, time-controlled machine for heating parts to be locally hardened is described in an elaborate booklet by the Fellows Gear Shaper Co., Springfield, Vt.

Employing six acetylene torches, this flame hardener uses the so-called "spinning" or work rotating method.

Is "Waiting For Big Machines" Stifling Your Production?

STANLEY ELECTRIC DRILLS include 15 different models, with capacities from 3/16" to 7/8" in steel. Heavy, rugged tools that will do the work of a Drill Press, mounted in a Stanley Bench Stand.

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30% MORE VISIBILITY— New Stanley "FLUD-LITE" Safety Eye Shield has 6" x 4" window of safety glass. Two long-life frosted bulbs give ample, shadowless lighting. Guard is adjustable from horizontal to a 45° angle for use in standing or sitting position.

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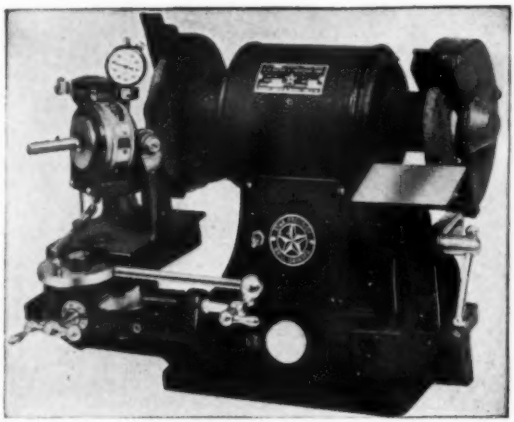

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Produce Perfect Points on Drills

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Precision ground drills cut faster and last longer—do better work and trim production costs. That's the kind of drills you can have with a STAR Precision Drill Grinder.

The STAR produces perfect points on standard twist drills—easily and quickly—without the use of attachments. It is equipped with a precision-made chuck which is adjustable for the entire range specified. Lip angles 29 to 89 degrees are obtained by setting the compound rest at the required reading. Each lip is set for the grind by indicator reading, making it possible to obtain variable clearances behind cutting edges. A zero setting gives a 12 degree clearance behind edge.

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Division Star Electric Motor Co., Bloomfield, N. J.

WELDING in Maintenance Work

By FRANCIS A. WESTBROOK, M. E.

THE railroads have, in the face of competition from motor transport and governmental regulation, been forced to employ every means of operating economy available, and it has been found that the use of welding is an excellent instrument to that end in the maintenance of equipment. This is the largest item of expense with which most railroads have to deal, next to transportation costs, so that any economies realized in this direction are of major importance. Consequently, the equipment that goes with welding is now a vital part of railroad repair shop equipment.

Large sums are being saved daily through the use of arc welding repairs of locomotive components which formerly had to be replaced with new parts. Another large saving is being realized by building-up worn parts which formerly had to be scrapped when worn down to a point where they could no longer be machined. This applies particularly to guides. Arc welding is considered the most economical for repairing broken locomotive frames or for introducing a new section to replace an old fatigued or worn section. Removal of the worn section is usually done by the oxy-acetylene cutting torch.

Before a frame is cut for welding, it has jacks placed under it to prevent strains from interfering with proper expansion. Tram marks are made with a center punch far enough on either side of the weld to be outside of the annealing range. The break is then cut out from both sides toward the center, making a double V having an angle of about 60 degrees. After this cutting operation, it is necessary to heat the metal for about eight inches on either side of the break in order to relieve or reduce crystalization, as well as remove oil or grease which might have worked into the metal deposited. The frame is then chipped smooth with a chisel after it has cooled. It is then expanded to allow for the contraction which will take place during cooling after the weld has been made, and during the annealing operation which is given to both weld and frame. The amount of expansion necessary varies from $\frac{1}{16}$ to $\frac{3}{8}$", depending on the size of the frame, and is accomplished by means of jacks, wedges and a gas or oil torch to heat opposing members when necessary to expand the frame in this manner. Finally the frame is checked for alignment and is then ready for welding.

The welder starts at the bottom of the gap between the apexes of the two V's and welds to the top. The first bead must extend all the way through the V. One important railroad, at least, always uses two welders for frames, one on either side, to prevent warping and to cut down welding time. A weld of well-formed vertical beads $\frac{1}{8}$" thick by $\frac{5}{8}$" wide is obtained in this manner.

The scale from each layer of deposited metal is removed by regular welder's tools consisting of a hand scaling hammer, wire brush, small air gun and caulking tool about 3/8" thick.

This user has found that 3/16th" heavy-coated welding rod is best for frame welding. Welding stresses are relieved by bringing the weld and adjacent metal up to a medium red heat and holding it long enough to soak through the weld, cooling slowly. Annealing is accomplished by hanging a piece of plate from the frame and building a brick furnace on it. The whole process must be carried out without permitting any cooling at any time as otherwise heavy stresses will be set up.

Welding Fireboxes

Joining the sheets in a locomotive firebox by means of the arc welding process has resulted in economies both as regards construction and maintenance of fireboxes. Heavy-coated welding rod is used, and the welds obtained are asserted to be equal to, or better than the plate itself as to tensile strength, ductility, and the ability to withstand repeated stresses. Maximum strength in the weld is obtained by using, in new fireboxes, the single V butt weld. After the weld has been completed on the fire side of the box the back of the weld is cut-in, in a V-shaped groove, deep enough to remove all flaws with a diamond-point chisel. This groove is then welded.

Many parts subject to wear are built up by means of welding, followed by machining. This applies, among other parts, to worn sides of frames at shoe and wedge fits, main equalizer saddles, equalizers and grooves in bands of springs, etc. Electric welding with bronze has met with much success for application to wearing surfaces, such as the wearing surfaces of radial buffer adjustable chaffing plates, eccentric crank arm liners and so forth. It has been found that when bronze is applied to a wearing surface against steel it lasts much longer than steel to steel. Brass and bronze crosshead gibs that were formerly scrapped now have their oversize bolt holes reduced and laterals maintained by building up.

Hard surfacing by applying a thin coating of wear-resisting alloy to wear-resisting surfaces is practiced to reduce maintenance of surfaces which normally wear rapidly. Important savings have been realized, for instance, by this method in the maintenance of the stationary radial buffer castings between engine and tender. The amount of surface to be covered is 176 sq. ins., which is accomplished with 1-3/4 lbs. of hard surfacing material in one hour. During an eight year period in which this method was used, none have had to be renewed, whereas before the adoption of this procedure, the radial buffer castings wore so rapidly that they had to be built up every 12 to 18 months.

Hard Facings

The technique of applying the hard surface is simple enough, although some experimenting was gone through with before the standard method was developed. The worn part is built up with mild steel, machined and a thin layer of hard surfacing applied with the carbon arc and bare rod. The carbon is gripped as close to the arc as practicable, as with a long carbon, exposure to heating vaporizes the latter and causes it to burn away very rapidly, resulting in excessive waste. Great savings have also resulted from hard surfacing the faces of links and link blocks.

Welding has also been used with excellent results in the maintenance and repair of the shop machinery of this railroad. Not only does this result in savings from the avoidance of purchasing new parts. Welding has, furthermore, made possible the construction and fabrication of many facilities in the

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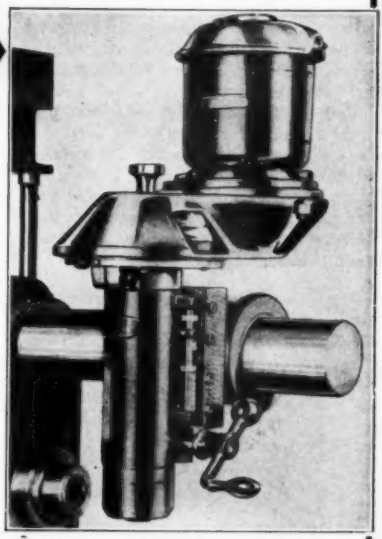
With its 4 inch vertical travel, many drilling, milling, boring and facing operations can be accomplished in one setup. The total weight is approximately 90 pounds, and it can be easily mounted by one man.

The Halco Head is engineered and built to precision limits in a modern shop by skilled mechanics. All parts and materials built into this machine are the very best obtainable and unconditionally guaranteed for six months.

Motor of heavy duty type, 1/3 H. P., 110 volts, 60 cycle, with plug-in cord and switch. Easily reversible for L. H. cutters. Five speeds 350 to 2900 R. P. M. Also 10 speeds 125 to 2900 R. P. M. available at extra cost.



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HALCO PRODUCTS CO.

14230 BIRWOOD AVE., DETROIT, MICHIGAN

shop that would not otherwise be provided. For instance, an air compressor which supplied the shop with air had an accident by which a large hole was knocked through the wall into the water space by a valve dropping through a valve seat. Cracks were found to extend under the cylinder head as well. To have ordered a new casting would have involved much loss of time and expense. As steel has about the same coefficient of cubic expansion as cast iron, a piece of the former was fitted in place and ¼" of bronze applied to it so that the cast iron piston head would not ride on steel. A furnace was built around the casting and then the welding was completed. It was allowed to cool slowly and was then bored out and new seats applied, resulting in a repair job in the least possible time.

At another time a disabled travelling crane was expeditiously repaired. An elevator worm gear which had all the teeth broken was put back in service in a day and a half at a cost of $97.00, for which an outside concern, the lowest bidder, would have charged $500.00 and required seven days to handle.

All cast iron parts of shop machinery that break in service are being replaced with welded steel fabricated parts, such as gears, pulleys, etc. New applications of electric welding are constantly being found in this railroad shop and the end does not appear to be in sight.

When engines come in that have met with accidents, great savings are frequently realized by welding. This is well illustrated in a tender frame which needed a new section that would have cost some $2500.00 and taken 90 days to obtain and put in place. Fabricating a new section in the shop by welding. the time was reduced to a fraction of that amount and the cost to $445.00.

Due to the frequent failure of cast steel parts on locomotives, this railroad has done much research to eliminate them. An example of what has been done along these lines is the fabrication of the all-welded guide yoke shown.

These examples, which could be multiplied almost indefinitely, will give an idea of the possibilities of welding in railroad shops. Many of the methods and results mentioned doubtless are applicable, more or less, to many other repairs in general industries involving machine shops.

ALL ALLOY **PORTABLE SHEARS**

FULLY GUARANTEED

Two Sizes

No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to ¼" steel plate.

Special Blades for shearing stainless steel.

BREMIL MFG. CO.

1720 Pittsburgh Ave., Erie, Pa.

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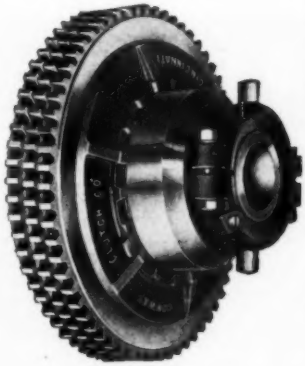
CONWAY CLUTCHES

(PATENTED IN U. S. A. AND CANADA)

at the controls of power, motion, direction and rest—



Easy engagement
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MILFORD PROFILE SAW

FOR ALL CONTOUR-SAWING, JIG AND BANDSAW MACHINES

Milford Profile Saw is guaranteed by the world's largest and most experienced manufacturer of metal-cutting bandsaw. That means it has to be right.

For years Milford Profile Saw was largely sold under the private brands of machine manufacturers. Now you can obtain it "right around the corner" at your Mill Supply House where a complete range of sizes, tempers, tooth styles, etc., is in stock ready for delivery by special messenger if necessary.

A machine for contour-sawing is no better than its saw. Just to prove the point, we will give you a sample length of Milford Profile Saw free. Simply write for it, giving specifications of saw you now use and make of machine.

THE HENRY G. THOMPSON & SON CO., NEW HAVEN, CONN.

MILFORD

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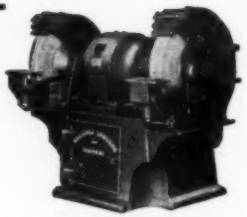
. . . Long Grinder Life
. . . LOW UPKEEP COST



NOTHING shortens machine life faster than abrasive grit and no machines are more exposed to its termite action than grinders and snaggers. Marschke Grinders are protected against this sabotage by the efficient ***triple-seal,*** long-life bearing assembly and internal grease reservoirs. From tough oversize spindles to massive stands and rugged motors they are built to "take it" under the most gruelling operating conditions.

Endurance is only one of the qualities accounting for the solid reputation of Marschkes. Made to machine tool standards, they perform as well as they look, delivering way-above-average grinder output at low wheel and maintenance cost. Write today for complete Catalog of the quality Marschke Line of Pedestal, Floor Stand and Swing Frame Grinders and Buffers, to

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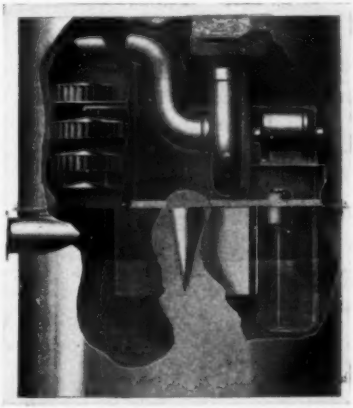
★ THE MARSCHKE ★ LINE

Novel Dust Control

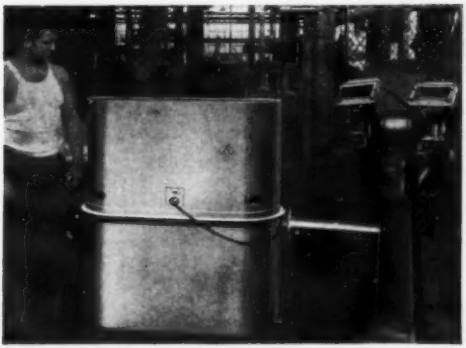
VISITORS at the recent A. S. T. E. show had an opportunity to observe a small-scale model of a Schneible Multi-Wash Dust Collector in operation. Its housing was of glass; neon tubes lit the interior, showing dust-laden air of the convention hall being cleansed of impurities.

A compact Multi-Wash unit is an integral part of the Midget Dust and Fume Collector. This portable unit is designed for use with individual grinders, saws, heat treaters and other units whose dust or fumes would otherwise damage men or machines. It is emphasized that this washing method of dust collection eliminates the dust hazard by converting it into sludge and also avoids weaknesses of cloth screens. Both motors and the fan are in the upper chamber and do not come in contact with any dust or wash water.

Dirty air is drawn into the Multi-Wash unit and strikes a horizontal baffle plate where heavy dust is precipitated in the tank water. The air continues to spiral upward through the spray walls and wet impingement plates. Each plate consists of a shelf with a center opening, upon which a ring of curved vanes is vertically imposed. Topping these vanes is a conical section with the point upward. The



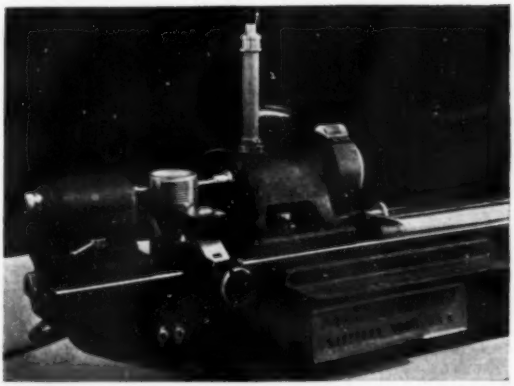
rapidly rotating air strikes these wet vanes at such an angle that dust, grit, and fumes are impinged thereon.



Water from a nozzle strikes the point and flows evenly to the entire periphery of the cone, forming a spray wall. This spray washes down dust and grit that has accumulated on the vanes and washes fumes from the air as well. The dirt laden water flows off the lowest plate and settles at the bottom of the tank as sludge.

The Midget is light in weight and easy to move. To operate, it is necessary only to plug into a 110-220 volt outlet and add water.

Standard Measuring Machine



In these hectic days when everybody is striving for more and better production, there is a crying need for precision gaging equipment such as the new Pratt & Whitney Standard Measuring Machine. This high-precision mechanism reads directly to one hundred thousandth of an inch.

Aptly styled "A Bureau of Standards in Your Own Plant," the Standard Measuring Machine should prove invaluable for checking plug and other gages and for such delicate tasks as the accurate measurement of screw threads.

A master bar is graduated at each inch interval, with extremely fine hair lines, visible only through a microscope. The bar is made of seasoned steel and graduations are transferred from a master bar calibrated at the U.S. Bureau of Standards, the errors of which are known and necessary corrections made.

The bed of the machine is a heavy casting of fine grained cast iron. It is put through a series of seasoning treatments between manufacturing operations which are said to require more than a year.

The measuring head provides subdivisions of the inch. The dividing screw attached to the dial adjusting knob moves the measuring anvil longitudinally. The measurement is read directly from the three dial scales beneath the magnifier on the head. The first scale indicates tenths and hundredths of an inch, the second thousandths and ten-thousandths, and the third or vernier scale hundred-thousandths of an inch. A metric head reading to two ten-thousandths of a millimeter is also available, with master bar graduated in units of 25 mm.

The manufacturer offers an attractive booklet describing this new machine in detail. It contains explicit instructions for determining the pitch diameter of a thread or thread gage by the three-wire method, which is recommended by the Bureau of Standards as the best means of assuring uniformity.

A Good Rigid Live Center will increase the cost of your Lathe about 1%; and its value 10%.

. . . "Manufacturing for 30 years without knowing that we needed live centers, until we saw the Rigid. Now we have 10 in use."

"No sir, I never saw a Live Center that would work" said a lathe manufacturer at the Cleveland show in 1935. Now he has sold hundreds on his lathes.

Aeronautical Products, Inc. "We have used Rigid Live Centers exclusively for years and have never seen one of them overloaded. While the same work from a dead center would have melted it."

Not one dollar ever lost on a purchase order.

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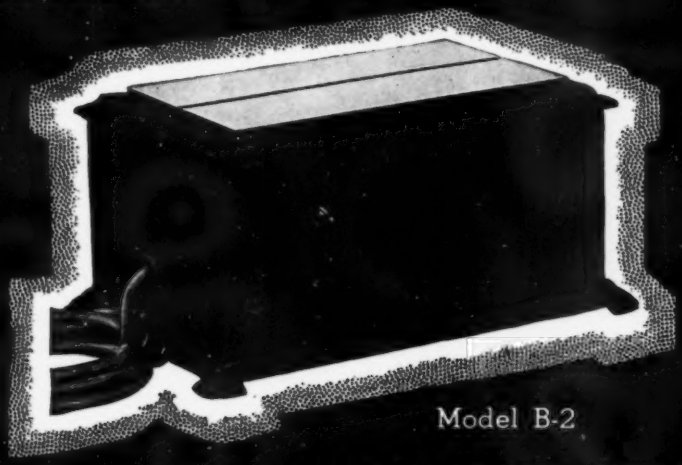
LW DEMAGNETIZERS

Engineered for quick removal of magnetism from work. Model B-2 is for large jobs and Model J-1 for small work. A single pass over the stationary poles demagnetizes the work completely.



Model B-2

Model B-2 working surface 7¾" x12"x6¾" **$60.00**

Model J-1 working surface 7¼" x7¼"x6¾" **$39 00**

Both Demagnetizers equipped with pilot light signal controls. Operates on 110 volt AC current.

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3 STEPS to SAVING TIME and MONEY

The order of today is greater production in less time—without lost motion. Let's all get going!

1 HANDEE
Tool of 1001 uses

The 12-ounce portable "power house" that repairs hard-to-get at parts on machines without removing the part. Smooths off rough spots on dies and tools, cleans delicate mechanisms—grinds, drills, polishes, cuts, routs, carves, sands, saws, sharpens; engraves, etc. Uses 300 accessories. Plugs in any AC or DC socket. Speed, 25,000 r. p. m. $18.50 postpaid with 7 Accessories.

2 HI-POWER GRINDER

Constructed for heavy duty service and does it give smooth performance! Enough steady, vibrationless power to drive a 2½" diam. wheel with precision accuracy. Speed 17,000 r.p.m. Wt. 3 lbs. In wood case with 3 Chicago mounted wheels, drum sander and bands, 2 collets, wrenches, dressing stones, $35.00.

In foundries, machine shops, tool and die plants —wherever metal is used or shaped—these three portables are necessary because they are of such tremendous assistance: (a) Handee Tool of 1001 uses, (b) Hi-Power Grinder, (c) a good stock of Chicago Mounted Wheels.

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BEST WHEELS EVER MADE— and the TOUGHEST!

The most important discovery in mounted wheels in 30 years. So strong that they give 150% to 300% longer life than ordinary wheels— and cost no more. They grind more pieces per wheel, faster and without sacrifice of cutting action. V/T Super Bond wheels hold their shape longer, will not ridge on grinding welds, sharp corners, sinking dies, barbering and other difficult jobs. But don't take our word for it—

TRY ONE—AND BE AMAZED!

Let us send a sample wheel. Tell us the kind of job, type of equipment you use and size wheel you'd like to make your own test.

10-DAYS FREE TRIAL

Send for either DeLuxe model HANDEE or the Hi-Power and try it for 10 days in your own plant.

- ☐ Send Free Wheel. Size_____ HB-6
- ☐ Catalog of Handee Products and Grinding Wheels
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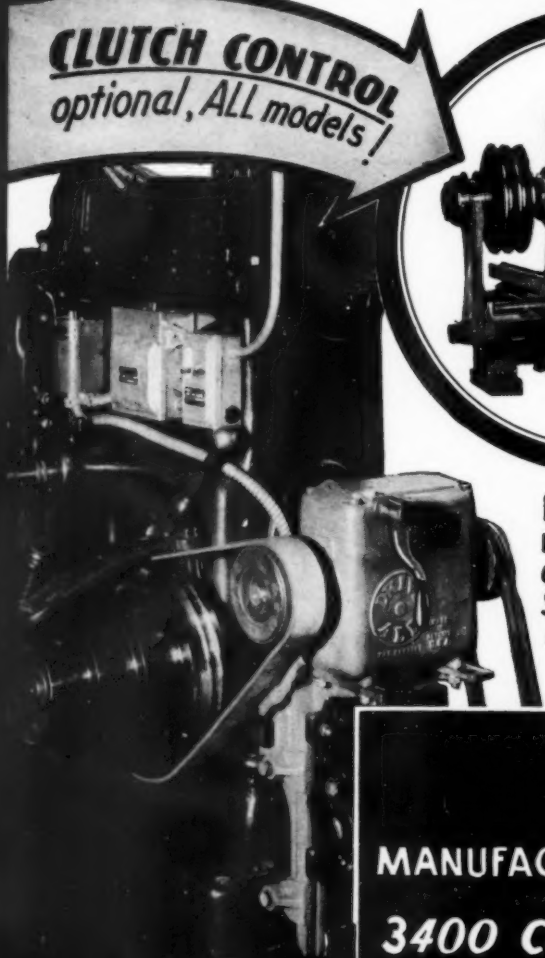
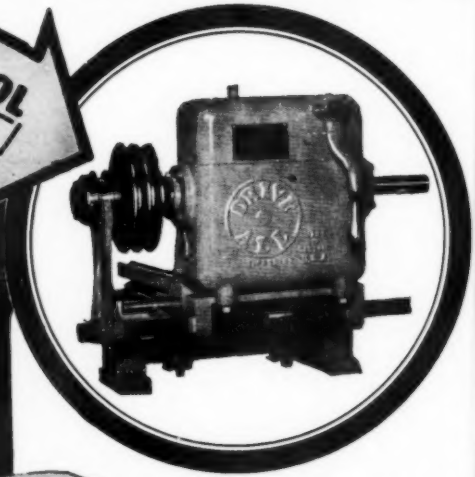
optional, ALL models!





Brackets to fit all machines up to 10 HP carried in stock, *also Special Units for Brown & Sharpe Automatics.*

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DETROIT - MICH.

Electrothermic-Permeation

BASED on a design which is described as the "Electrothermic-Permeation" principle, an improved type of internally heated electric salt bath furnace is announced. It is claimed to be capable of producing more uniform heat, reducing fuel costs, and eliminating excessive spoilage of carburizing salts. With numerous installations on various types of heat treating work, in operation for extended periods of time, the Upton Electric Furnace Co. has now placed the entire line of electric salt bath furnaces on the market.

Range of operation available with the furnaces includes virtually any heating operation requiring temperatures of from 300 to 2500° F., and the "proving" period for the furnaces is said to have covered almost every classification of temperature, composition and size of work. Furnaces are now available for carburizing, cyaniding, hardening, brazing, heating for forging, treating aluminum alloys, tool tipping, etc., in a range of sizes suitable for either batch or continuous operation.

Specific advantages claimed are:—Greater efficiency due to generation and distribution of heating throughout entire pot with larger percentage of heat developed at the bottom; elimination of "super heated" spots to destroy chemical balance of bath; spacing of elec-

Furnace designed for any liquid heat treat operation requiring a range of temperatures of from 300 to 2500 degrees F., employing "Electrothermic - Permeation" principle. Model shown is a single pot furnace for carburizing.

"High-speed-steel" furnace consisting of pre-heat, high heat and quench with ceramic brick lined pots. Recording type temperature controls shown were selected by the user.

trodes to prevent possibility of "shorting" and burning the work; 20% greater working area.

The Electrothermic-Permeation principle takes its name from the fact that heat for the bath is generated throughout all the effective working space rather than in a confined, separate heating area. Distribution of current flow for heating the salt is by unique patented arrangement of electrodes so that the greatest heat is at the bottom of the pot, with the balance decreasing in intensity as it approaches the surface of the liquid.

Electrodes are installed outside of the normal working area in opposite corners but are so inclined that their lower ends tend to converge. The resulting concentration of current is asserted to generate a greater amount of heat at the bottom of the pot, thus creating active thermal circulation throughout entire bath. Since the electrodes are inclined outward, the amount of heat generated decreases toward the top of the pot, because of the increasing distance between the electrodes. However, this diminishing value of current creates a carefully distributed volume of heat for maximum uniformity of heating.

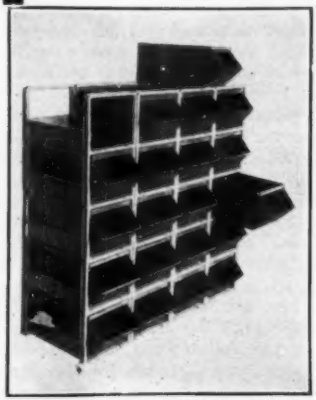
Thus, it is explained that even though a basket of small screw machine parts, for instance, may interfere with full circulation of heated salt from the bottom of the pot, evenly distributed current will generate compensating heat in the salt among the parts.

It is asserted, however, that overheating of the work itself does not occur because of the vast difference between the electrical resistance of any metallic part and the electrical resistance of salt.

The accompanying schematic illustrations show how approximately 80% of the heat is generated at the bottom of the pot, where the electrode ends are close together, with the balance being distributed upwards and tapering off as it reaches the top. In the design, it will be noted, there is nothing that endeavors to force the circulation of heated salt against its natural, upward, movement. This, together with wide electrode spacing is said to eliminate the possibility of "super heated" areas, which hasten deterioration of carburizing salts especially, and insures a more evenly distributed temperature.

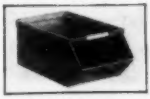
Additional advantage claimed for this design is that the basket must be suspended and this automatically prevents

A Storage Unit That
REDUCES HANDLING
of Parts and Materials

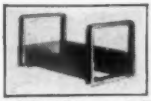


"Stacked and Still Accessible"

Because Stackbins are portable containers—not fixtures—parts and materials can be carried to departments, from machine to machine, or held in stockrooms without being transferred from one container to another. Stored in Stackracks, any Stackbin is instantly accessible when its contents are needed—without disturbing any other bin.



STACKBINS are individual hopper-fronted stacking bins, designed for storage, transportation and assembly.



STACKRACKS are individual units which lock together to form storage racks of any size, shape or capacity, into which Stackbins slide like drawers.

STACKBINS in STACKRACKS offer a storage system that reduces handling, saves valuable space and speeds work. Write us for complete details and low prices.

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KNURLED SOCKET HEAD CAP SCREW
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Every mechanic prefers to use his fingers instead of a wrench. The cold-forged knurled heads—dry or oily—gear right to the fingers, no slip, no loss of time . . . and with the wages paid today time is indeed money! The knurls serve also to lock the "Unbrako".

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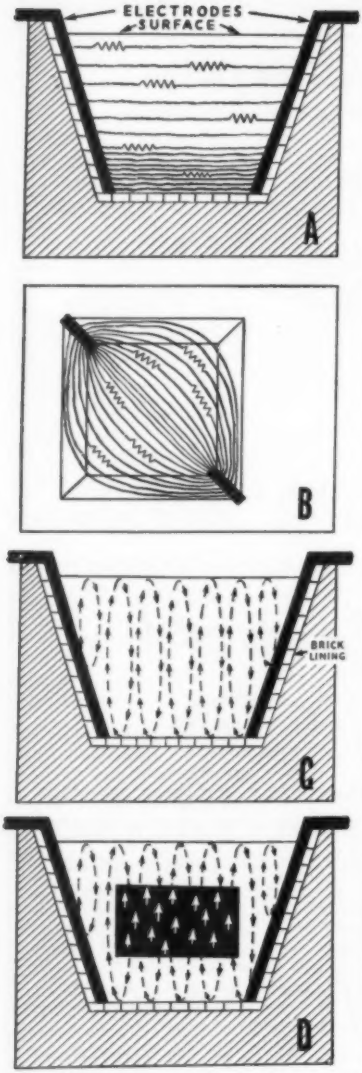


the work from being placed on the floor of the pot which would cut off the proper circulation of heated salt.

Ceramic brick pots have been adopted as standard. Development of this type of pot is claimed to have incerased pot life to such an extent that the Company guarantees them for one year, even on high speed steel and similar work requiring extreme temperatures.

Two styles are furnished. The high temperature type has an inner lining of special alloy steel insulated on both sides, with the interior of the pot itself being lined with two kinds of ceramic brick to withstand abrasion, thermal shock, and corrosion respectively. The exterior of the pot assembly is welded plate.

The low temperature pot, which is also guaranteed for at least one year of operation, follows the same general design, but does not require the special alloy lining. Both types are built with the walls at such an angle as to best withstand the effects of expansion and contraction due to the range of temperatures involved.

Temperature controls of the indicating or recording type are of standard makes and are available in several different models to suit individual requirements.

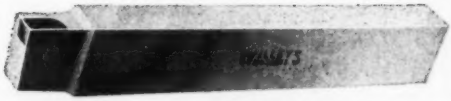
Water cooled electrode bus bars and connectors increase efficiency by providing better conductivity and are so designed that the time required for electrode replacement does not exceed five minutes. Furnaces are available in a complete range of sizes to suit any batch of continuous operation.

(A) Distribution of current. Maximum at electrode ends and diminishing toward the top of the pot as electrodes incline outwards.

(b) Distribution of current is claimed to cover entire area of pot.

(C) Flow of heated salt is natural, does not "buck" normal thermal convection.

(D) Generation of heat in every portion of the bath—even through a basket of small, densely packed parts.



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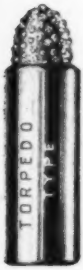

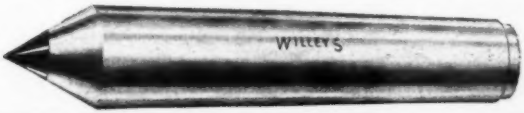

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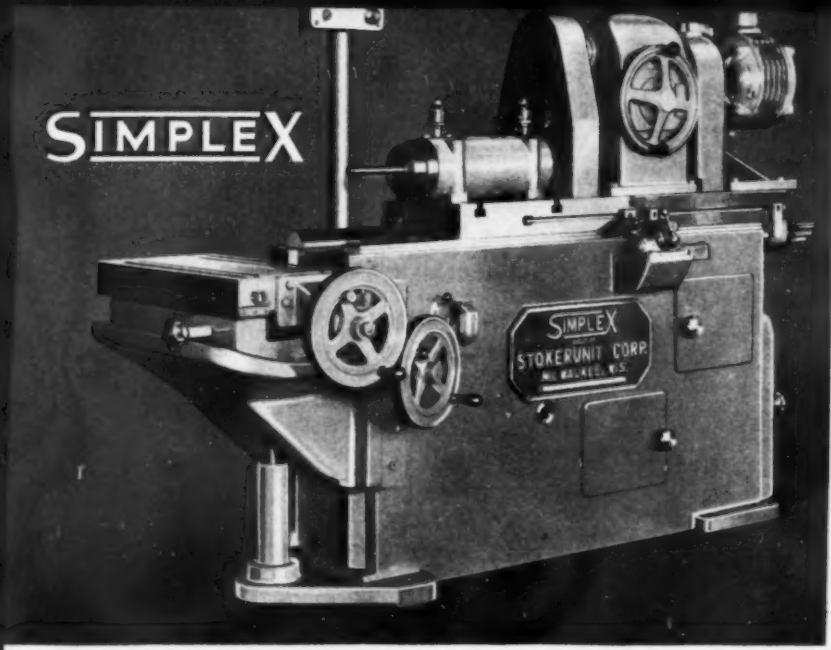


A General Purpose Precision Boring Machine

The Simplex Knee Type Precision Boring Machine adds such flexibility to precision boring that a much greater variety of work can be handled on one machine. Vertical adjustment of the knee permits the use of work fixtures of simple design and in a wide range of sizes. This saves much time and expense on short runs.

The table mounted on the knee is provided with a stop and can be hydraulically indexed between two adjustable position stops or can be moved by the graduated hand-wheel and screw. Both table and knee can be equipped with dial indicators and length bars for precision setting when boring a number of holes in one piece. The two standard models are the 2U-KT with 13" x 27" table and No. 3 spindle, and the 3U-KT with 18" x 36" table and No. 4 spindle. Spindles have variable speed drive.

★ ★ **Stokerunit** CORPORATION ★

4549 WEST MITCHELL ST. • MILWAUKEE, WISCONS

What's New in the Industry

J. & L. Automatic Internal Thread Grinding Machines

THE Jones & Lamson Machine Co. announces a line of New Fully Automatic Internal Thread Grinding Machines. These machines are now available in several Models:

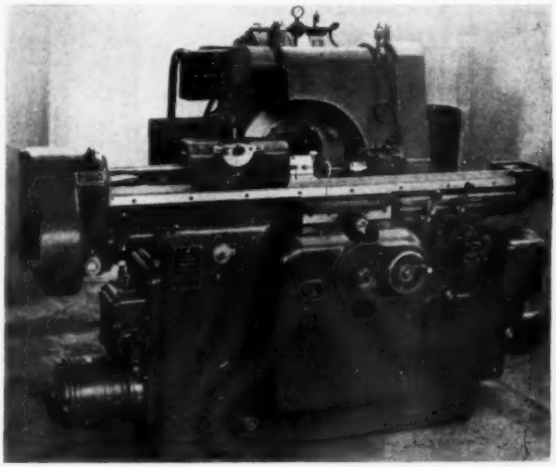
Model TG-63 swings 7-½". It will grind threads up to 6" diameter and 3" maximum length, in work up to 10" maximum length overall. A separate lead screw and nut for each different pitch is required. This model is a light, fast machine for work within its capacity.

Model TG - 624 swings 7½". Grinds threads up to 6-½" diameter and 5" maximum length, in work up to 24" maximum length overall. This model is completely universal and is capable of handling toolroom or production work of any size or weight within its rated capacity.

Model TG - 1230 swings 21". It will grind threads up to 14" maximum diameter and 5" length, in work up to 24" maximum length overall. This model is completely universal and is capable of handling toolroom or production work of any size or weight within its rated capacity.

For models TG-624 and TG-1230, a hardened and ground master lead screw and pitch change gears are furnished as standard equipment, for grinding any pitch thread from two to 48 inclusive, either right or left hand, and either single, double, triple, quadruple, or sextuple lead.

On all models, the grinding wheel spindle is automatically withdrawn from the grinding position to the wheel dressing position, the wheel is dressed automatically, and the grinding wheel spindle is returned to the working position. The amount dressed off the wheel is compensated for automatically, and the machine feeds in automatically on successive cuts until size is reached. When size is reached, the wheel spindle is automatically moved to the dressing position, and the machine stops. Each model is provided with a direct current wheel motor with rheostat control to permit a complete range of grinding wheel speeds.



An air cylinder is used to obtain rapid movement of grinding wheel spindle from working position to dressing position and vice versa. All units thus far furnished have been air operated, but hydraulic operation is possible—and can be furnished at an extra charge.

Ample clearance is permitted for gauging and changing the work. When machine is in gauging position, a safety device locks position of the grinding wheel spindle to prevent accident to operator while gauging or changing work and eliminate trouble caused by air pressure failure.

These machines are designed to reduce non-productive time to an absolute minimum. As an illustration, on some jobs the grinding wheel spindle is removed from working position to dressing position, and returned to working position in less than two seconds, including dressing time.

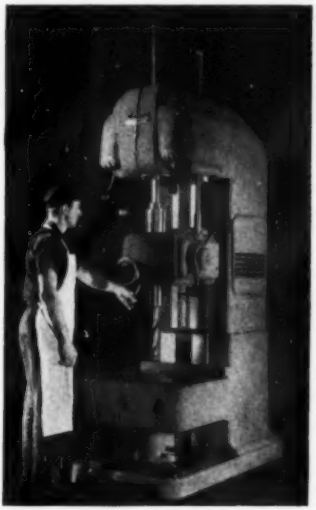
Sibley Offers 25″ Drill Press

A new 25″ swing, all-geared Drilling Machine is announced by Sibley Machine & Foundry Corp.

The makers emphasize that precision accuracy and a rugged design have been built into this new drill press, permitting it to handle fine tool room and production work, as well as heavy, tough drilling jobs.

Instant changes of feeds and speeds are effected by levers within easy reach of the operator. Both levers are cam operated. Spindle speeds range from 75 to 1500 r.p.m. Feeds range from .005″ to .045″. The six splined spindle can be operated either by power or hand feed; the travel by power is 12″ and by hand, 12½″. It takes No. 4 and No. 5 Morse Taper.

The all-geared drive is obtained through a series of alloy steel, heat-treated gears mounted on horizontal shafts. The transmission is totally enclosed, but is a complete removable unit with the transmission shafts



mounted on anti-friction bearings. Multi-splined shafts are used throughout. All gears operate in a bath of oil.

Tapping operations are controlled by electrical reversing switches, operating through a starting lever.

Height overall is 9′6″. Maximum distance, spindle to base is 33″. The working surface of table is 18-½″x24″.

FOR DEFENSE

KARELSEN'S DIAMONDS KEEP THE WHEELS OF INDUSTRY TRUE

DIAMOND POINTED EMERY WHEEL DRESSERS

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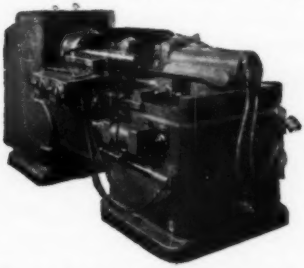
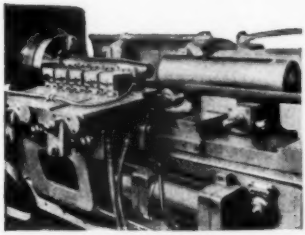
MOREY "27" Semi-Automatic Lathe for Rough Turning 155 MM Shells

Minimum cutting time—maximum feed and speed that the work and tools will permit. Loading time from conveyor to belt about 5 seconds.



MOREY "27" Semi-Automatic Lathe tooled for rough turning, cutting off, and facing 155 MM Shells. Machine shown with hydraulic arbor and tailstock in loading position



Close-up of MOREY "27" Semi-Automatic Lathe, tooled for rough turning, cutting off and facing 155 MM Shells. Machine shown with rough forging, ready to slide on the arbor.

Write for detailed information.

MOREY MACHINERY COMPANY, INC.

410 BROOME ST., NEW YORK CITY

CRESCENT *Spot Welders*

By Designers of Special Welding Machines

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2. Approved by the Board of Underwriters.
3. Guaranteed for life against mechanical defects so long as machine remains in hands of original purchaser.
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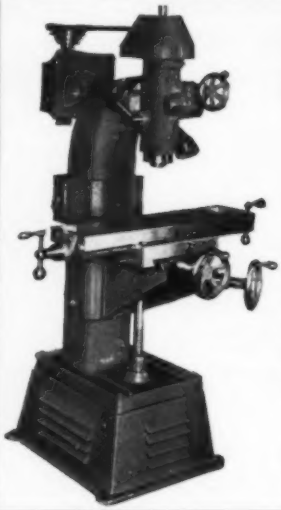

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Jackson Machine & Tool Company Sales Division
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New Line of Horizontal Broaching Machines

New features and improvements are included in a complete new standard line of universal horizontal broaching machines offered by Colonial Broach Co. Standard machines range in capacity from 3 tons and 36" stroke to 25 tons and 90" stroke, with larger capacities also available on special order.

Peak capacities have been substantially increased over the normal ratings.

A shock-proof control mechanism is used to prevent impact of the starting lever at either end of the stroke. A readily accessible and increased vertical adjustment for the drive head provides greater flexibility for off-center special broaching set - ups. Provision for convenient mounting of spiral broach drive heads has been main-

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Mechanized forces that batter and conquer the enemy—mechanized forces that obliterate and overcome the forces of opposition such as lost time, wasted power, and meager production. That's what we offer in **Modern Motor Drives.**

A mechanized toolroom is the first requisite for the defense of our nation. Then a mechanized army will be easy.

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FROM $22.50 PER WEEK

Meals Included

Mr. and Mrs. Harry Becker, Owners

tained, adapting the machine to spiral broaching set-ups.

Cylinders are of steel tube construction with welded joints. Valves and piping have been simplified. An integral motor and pump bracket assures correct alignment between these units. A rigidly constructed chip pan is provided, which can be used for a broach follow-rest support, when required. The chip compartment is readily accessible.

The main frame is of welded steel construction, using steel castings wherever necessary to strengthen points where excessive strain is applied, such as face plate, cylinder mounting, etc., and so designed that it completely encloses the operating mechanism of the machine. The machine face is of sufficient area to support and attach surface broach fixtures, and provided with an extremely large hole to permit maximum broach capacity. The face has two keyways placed centrally with the hole and 90° to each other, affording a positive and accurate locating position for fixtures. The cross-head has replaceable hard bronze shoes which ride on hardened and ground ways and are provided with means of lubrication. Both cross-head and pull-head have identification marks to indicate when pullers are adjusted centrally with keyways on the face of the machine.

Hydraulic tank is provided of ample capacity. An oil level gage mounted on side of machine indicates the available supply of hydraulic oil. All machines are equipped with heavy-duty, large volume coolant pumps.

Hardinge-Morrison Consolidation

Effective June 2nd, 1941, the name of Morrison Machine Products Division of Hardinge Brothers, Inc., Elmira, N. Y., will be discontinued and all business will be carried on under the name of Hardinge Brothers, Inc.

This consolidation is for the benefit of the many customers of both divisions in that the one name, Hardinge Brothers, Inc., will concentrate correspondence, shipments and the carrying of the account under one name instead of two names.

Factories

A favorable picture of the possibilities for expanding America's manufacturing industries for defense is given in a survey of factory growth during the last four decades, published today by the Public Affairs Committee, 30 Rockefeller Plaza, New York City.

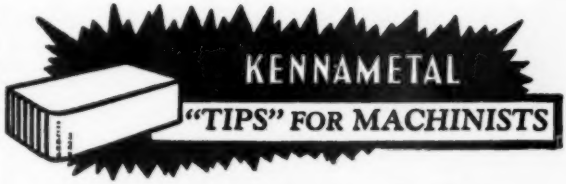
The survey, titled "America's Factories," was summarized by Maxwell S. Stewart from a long-range study of American manufacturing industries made by the National Bureau of Economic Research.

It shows that the output of manufacturing in the United States enjoyed an average increase from 1899 to 1937 of 3½%, or more than twice the growth in population during the period. The increase is considerably larger than had been supposed on the basis of earlier and less complete studies.

The most spectacular gain was made by the automobile industry. Two other industries also vital to national defense —machinery and chemicals — enjoyed gains far above those of industry as a whole.

Strikingly enough the industries which forged ahead the most were usually those which made the most substantial reduction in prices and the greatest technological advance. The industries which have reduced the amount of labor necessary for each article—either by new machines or more efficient methods—have increased their production so greatly that they have actually employed more labor than ever before.

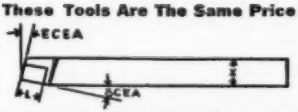
In 1899 one man turned out 1.7 automobiles in a year. Thirty years later ten cars were produced for every man employed.



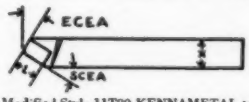
HOW TO GET QUICKER DELIVERIES ON NON-STANDARD KENNAMETAL TOOLS

If a standard **KENNAMETAL** - tipped carbide steel cutting tool does not exactly fit your needs, you can often save money, and get quicker deliveries, by ordering a "Modified" Standard **KENNAMETAL** tool. Modifications may be made either in tool angles or in shank dimensions, *with no increase in cost.* One such modification is illustrated herewith.

These Tools Are The Same Price



Standard Style 11T80 KENNAMETAL tool with 15° SCEA, 15° ECEA, and 7" long shank



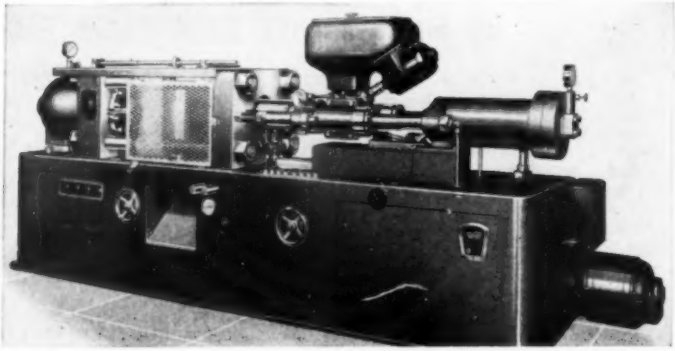
Modified Style 11T80 KENNAMETAL tool with 30° SCEA, 38° ECEA, and 5½" long shank

Send today for our new Catalog No. 41 listing standard styles and prices for **KENNAMETAL** tools. Also ask for leaflet showing how to order Modified tools.

Plastics In Defense Program

Zinc, Aluminum and other essential metals are being replaced with plastics as fast as the change-over can be made. This change-over is one of the immediate defense requirements of this country. Anticipating this need, H-P-M has designed and built a line of 12 ounce single nozzle plastic injection molding presses.

num industries will be greatly relieved by the substitution of plastics. H-P-M builds three smaller capacity injection presses of 2, 4 and 9 ounces injection capacity per cycle. These are all of single nozzle design, similar to the 12 ounce size illustrated, except smaller in size. Larger injection presses of 18 and 36 ounce capacities are also avail-



Besides conserving valuable metals, these machines will speed up production of plastic parts to meet today's peak manufacturing requirements. The machine illustrated was designed primarily for injection molding of large plastic parts where multiple injection molding is not required. It should take over the work of the large die casting machines, releasing their production for defense needs. Also the rolled and cast aluminum

able. These larger machines with multiple injection units are especially adaptable for large area work.

Fundamentally, the 12 ounce machine incorporates the powerful straightline hydraulic clamp which is important for the successful molding of large parts. The "live" hydraulic force that "backs up" the clamp assembly, after mold is closed, assures positive sealing of mold

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Patented design. Enclosed actuating lever operates valve through ball and socket joint. No packing glands, external levers or buttons. Slight flex of hose controls air flow.

Made of bar brass and stainless steel. Sizes for 3/16 to 3/4" air hose. Other models—literature on request.

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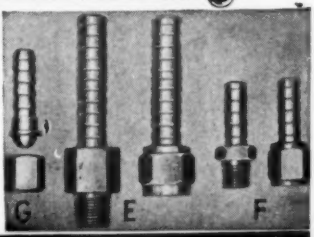

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Special holders available for use with all types of automatic and hand screw machines.

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halves. Also the clamp automatically adjusts for molds of any thickness thereby reducing die set-up time.

Speed of the injection plunger must be rapid to inject large quantities of material per cycle. This is especially true with the 12 ounce machine and full injection output is provided at a more rapid injection plunger speed than for smaller capacity presses.

Control of temperature at the material heating chamber is of primary importance when molding large plastic pieces. The circulation fluid heating system provides uniform heating of plastic material. When molding large cavity castings it must be remembered that each casting is valuable from the material standpoint. Any "rejects" even though the material can be re-used by regrinding are decided losses.

Force-feed of material with a positive measuring feature permits use of the 12 ounce capacity press for producing smaller moldings. Thus the 12 ounce machine can "pinch hit" for smaller machines. If all parts are small, then a smaller capacity press should be installed, but if there is a combination of small and large parts, one 12 ounce injection press will serve both purposes.

The 12 ounce injection presses are equipped with standard Hydro-Power radial piston type pressure generators. The only maintenance required is that after a certain number of running hours, the tapered roller bearings that separate the vital working pump parts should be "taken up" for bearing wear, which can be accomplished without dismantling pump.

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We have every facility — adequate precision equipment and expert workers—for the quick and efficient production of all types of Gages, Special Tools, Dies, Jigs and Fixtures, large or small. We have complete heat treating equipment and can handle jig boring jobs on our 18"x36" Pratt & Whitney jig borer. Have been delivering satisfaction since 1929.

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Shear Cut End Mills are offered in all standard sizes, single and double end. Write today for catalog and prices.

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Numbering Machines
Automatic and Hand Operated
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For Marking Metal Parts, Name Plates, Metal Checks, etc.
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Tungsten

Placing of tungsten products under the Federal priorities system, along with aluminum, magnesium, etc., will probably not affect the production of tungsten carbide tools, according to Mr. W. G. Robbins, President, Carboloy Co., Inc., producers of such tools.

"It is quite likely," Robbins pointed out, "to place greater emphasis on the use of tungsten carbide tools. It is not generally appreciated that Carboloy and some other types of tungsten carbide tools permit a great reduction in the amount of tungsten needed for cutting tool purposes. Tungsten is an important alloying element of conventional high speed steel tools, in which it represents about 18% of the weight of the complete tool.

"In carbide tools, in contrast, tungsten is used only in making the tip, representing a small proportion of the weight of the entire tool. An average tungsten carbide tool thus contains less than one fifth the amount of tungsten needed for a high speed steel tool of the same size.

"The amount of work a tungsten carbide tool will do before it has to be scrapped may be as high as 50 times as great, with 20 to one as a conservative average. This is due to two reasons: the number of 'pieces per grind' is greater with tungsten carbide tools; and it takes only around .010" of grinding to sharpen a tungsten carbide tool compared with 1/16" for most high speed steels.

"Taking these figures together, it will be seen that one pound of tungsten in a tungsten carbide tool will do the work of, say, 100 lbs. of the metal in conventional tools."

Snap Gages with Dial Indicators are faster

These two modernized Snap Gages will not only save you a lot of time, but they will insure more uniform inspection. They are light, fast, and the upper gage is adjustable for size.

No Indecision

You see immediately how the size compares—no forcing or guessing. Made in various styles and sizes.

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PRECISION MEASURING INSTRUMENTS

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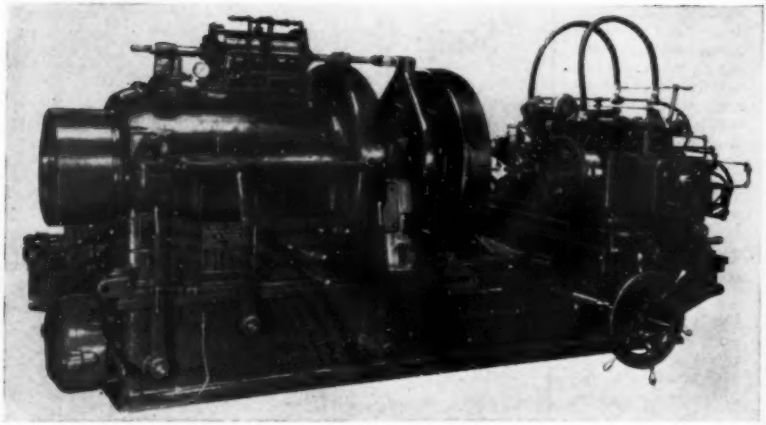
Bomb Turning and Threading Machine



A machine for completely finishing the tail ends of bombs at one chucking has been designed by Landis. Three tool units attached to a carriage and cross slide are provided for turning, facing, chamfering, boring, recessing and threading operations.

One tool unit, comprising a tool head with four tangential type cutters and attached to an hydraulically controlled slide, turns, faces and chamfers end of bomb.

A second tool unit has an hydraulically controlled slide to which is attached an adjustable six blade cutter head for finishing the bore, and an auxiliary hand operated tool slide for machining the angular face and undercutting on the body of the bomb and the adjacent recess.

The third tool unit, attached in a fixed position to the cross slide, comprises a 40 AX Landmatic Die Head designed for cutting fine pitch threads on large diameters. A leadscrew mechanism is provided in conjunction with the Head. It propels carriage along ways so the die head advances onto the work at a uniform rate of speed assuring accuracy of thread lead.

All movements of tool slides and cross slide are hydraulically controlled, with

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Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

GROBET FILE CORP. OF AMERICA 3 Park Pl., New York, N. Y.

circuits arranged with interlocks. Cross slide is hydraulically locked into position on carriage when any of the tool slides is in action. Operating controls are centralized at front.

A variable speed motor driven headstock is provided which includes a selective sliding gear transmission with eight speed ranges.

Leadscrew mechanism is mounted in bed and is equipped with a pick off geared drive for a range of 6 to 14 threads per inch. A leadscrew thread indicator is built in.

The bomb to be machined is then pushed through spindle bore from rear until it contacts work locating device. The bomb is gripped by the pneumatically operated chuck. Turning and facing tool slide is then rapidly advanced towards bomb and automatically brought to a predetermined turning feed rate just before tools enter cut. A second predetermined rate of feed is automatically engaged just before tools start facing cut. At completion of turning, chamfering and facing operations, tool slide is retracted rapidly from bomb and then cross slide is indexed against the mid-position stop, bringing boring tool slide into working position.

Boring tool slide is advanced rapidly towards work and automatically reduced to a predetermined rate of feed before tools contact work. At end of boring operation, recessing tool is fed by hand to a positive stop for finishing the angular surface and adjacent recess on body of bomb. After recessing tool is returned from cut, the boring tool slide is rapidly retracted. Cross slide is moved against a third stop which brings the die head into operating position.

End of bomb is then threaded, using the leadscrew mechanism. The leadscrew nuts automatically open when threading operation is completed. Carriage and cross slide are then returned to original starting position and bomb is removed.

SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½" by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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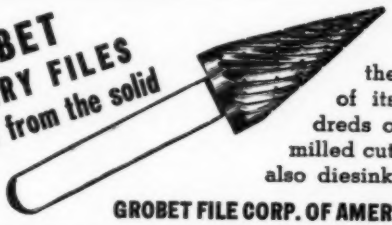
GROBET ROTARY FILES ground from the solid



Ask for Catalog WG

the most complete catalog of its kind, illustrating hundreds of rotary files hand cut, milled cut, ground from the solid; also diesinkers' burs.

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Gardner No. 186-30" Horizontal Disc Grinder

Like the other types of 30" Horizontal Grinders in the Gardner Machine Co. Line, the No. 186 machine is adapted for numerous operations where simply a flat surface is to be produced, the ground area not being required to have a definite relation to any other portion of the casting. In addition, when equipped with a hand-operated swinging work table it may be used to produce two surfaces of one casting, in an accurate relation with each other.

Two new features include a louver - type removable guard ring, which aids materially in efficient removal of the dust and grit of grinding and a swinging bar-type dresser, which provides maximum rigidity and facilitates dressing at any time.

The entire machine is of massive design. It carries a steel disc wheel 30" in diameter, traveling in a horizontal plane. This wheel is mounted on a substantial supporting flange, or wheel collar, 20" in diameter, fitted to the upper end of the main spindle.

Either wet or dry grinding can be performed. When operated as a wet grinder, a welded steel outside settling tank, complete with motor-driven pump, and fittings, is furnished. Such a settling-tank is said to provide an ample flow of coolant free from the accumulated sludge of grinding, which might otherwise fill or clog the abrasive wheel.

The Dresser pivots from a 2¾" dia. shaft. Heavy arm supporting the bar is

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Especially suited for large diameter work, as a sub-base can be made of proper height to give necessary clearance for work.

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SHELDON Back Geared Screw Cutting PRECISION LATHES

1' Collet Capacity— Ball or Roller Bearing

No. BB U-1136 WQ Sheldon 11" swing 36" between centers pre-loaded ball-bearing spindle, hardened and ground all over, inside and out with 1⅜" hole thru center, hand scraped bed, ways (2 V-ways, 2 flat ways) full quick change gear box, worm feed apron with power cross feed, thread chasing dial and 4-speed lever operated underneath pedestal motor drive, and telescopic taper attachment.

Write for Catalog showing complete line of Sheldon Precision Tool Room and Manufacturing Lathes, attachments and accessories; Sheldon Arbor Presses and Sheldon Drill Press and Machine Vises.

• SHELDON MANUFACTURING CO., Inc., 1629 N. Kilbourn Ave., Chicago, Ill., U.S.A.

an inverted U-section, ribbed to withstand strain. The sturdy steel bar carries a ball-bearing dresser head with heavy-duty spindle. When in use, the entire arm is swung into the center position and locked by means of two clamping screws, thus bringing cutters on center of abrasive wheel. The operator then slides the head back and forth in the customary manner.

When grinding small work, dresser may be left in the dressing position at all times. When handling large parts, it may be quickly swung back out of the way.

Spindle is mounted on high grade ball bearings, and measures 3¼" in diameter in the bearings at upper end. The lower bearing is a combination radial and thrust type, with a rated load of 10,400 lbs. All bearings are housed in completely dust- and water-proof housings.

This machine may be equipped with a 36" diameter steel wheel and guard ring, for larger jobs.

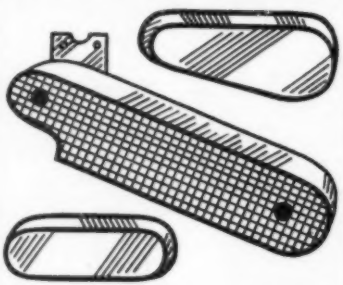
Hydraulic Power Saws

A new 12-page catalog (No. 50-A) recently published by Peerless Machine Co., Racine, Wis., is packed full of action pictures and metal-cutting data of special help to companies who have defense contracts for heavy artillery.

Especially interesting are illustrations of machines sawing square billets for shell forgings, round stock for rifle barrels, and tool steel as required for new forging dies. In addition to cutting-time estimates on the popular current varieties of steel, 1040, 1050 and 1340, there is a page on cutting speeds for all materials ranging upward from low carbon bars to thin-wall tubing.

A table on blade recommendations covers numerous combinations of speeds, feeds, and materials which can be cut with these new hydraulic automatic saws.

PLAY SAFE!



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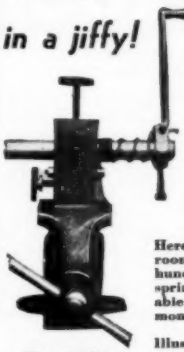

Here's a profitable tool room unit. Quickly makes hundreds of sizes of springs. Sturdy, dependable . . . a real time and money-saver.

Illustrated is No. 4 Universal with adjusting shaft of 5/8" square. Takes wire up to 1/4" diam.

Patent No. 2052443
Write for your Circular.

THE JOHN BLANER CO.
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Plastics

"Plastics in Industry" is the title of a book just published at $5.00 by the Chemical Publishing Co., Brooklyn, N. Y.

The vast range of application of plastics in modern production is here organized and made accessible. Forty — seven photos and diagrams enliven the text.

An exact description of the plastics industry as distinguished from other fields is given. This is quite helpful to get background and a perspective of the industry.

Chapter 2 describes and illustrates the two basic types of plastics —thermo-plastics and thermo - setting plastics. Those whose finished hardened shape can be re-softened by heat and re-molded are generally called "thermo - plastics." Those whose hardened shape can not be re-softened or re-molded are "thermo-setting plastics."

The question of official specifications (or lack of them) for plastic materials is covered. The general principles of molding and fabrication technique are outlined in Chapter 4.

The greater part of this volume, however, is devoted to the industrial applications of plastics. Entire chapters are devoted to such subjects as the use of plastics in the electrical industry, in aircraft construction, in motor - car manufacture, etc. The use of plastics in machinery is covered, with special emphasis on their use in chemical machinery.

The many fields explored with regard to plastics utilization include the textile industry, building, synthetic glues, synthetic rubber (neoprene, etc.), furniture manufacture, and packaging and display. The author also covers the "fancy goods trade"—novelties, etc.—with which the consuming public is so well acquainted.

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required . . . . . Permanent magnets
have strong holding power — last indefinitely
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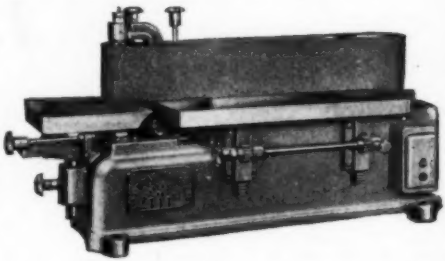
BS
BROWN & SHARPE

Portable Edge Belt Sander Polishes Metals

The No. 111 Ekstrom-Carlson Portable Heavy Duty Edge Belt Sander should interest both the wood and metal-working trades. It should prove highly useful in furniture, radio, novelty, and sporting goods factories, and in many other places where wood is sanded. It is asserted that the sander is successful for polishing steel and other metal parts, for grinding die sections and cams and for polishing plastics.



Although this new sander is a portable, bench type machine, it is of considerable size and is built on rugged lines which make it suitable for accurate, continuous, production work. The frame of cast iron, properly distributed, is said to assure vibrationless operation.

The No. 111 is regularly provided with a front table. Also available is an end table which can tilt to 20°. Tables are independent of each other, making it possible for two operators to work simultaneously.

Power is provided by a one h. p. motor mounted in the base. On motor is mounted the pulley which drives the abrasive belt. Lubrication is afforded by a force feed system with grease gun connection for all moving parts. It is claimed that this method prevents entrance of abrasive particles into vital parts of the machine.

Besides straight edge sanding and polishing, the No. 111 has other uses. Stationary forms may be employed successfully for the sanding of delicately membered work. The form can be constructed to suit the individual requirement.

Some specifications of the No. 111 Portable Heavy Duty Edge Belt Sander are:—height, 23½"; length, 45"; width, 18"; sizes of front table, 8"x26"; vertical adjustment of front table, 4"; size of sand belt, 78"x6". domestic shipping weight, 350 lbs.

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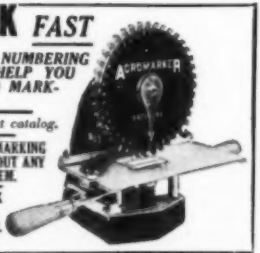

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Be Sure to Take Advantage of This Special

TRIAL OFFER

60c

Surpluses

Materials surpluses in the United States after the present war may help solve economic problems instead of becoming a drug on the market, Andrew H. Phelps, a Westinghouse official, declared recently in an address before the Mining Club, Inc., in New York.

He claimed that fundamentally there can be nothing wrong in changes which enhance our supplies. Businessmen must learn not to fear the superabundance of material which American engineering genius is making available to them.

"Materials should instead be regarded as potential instruments for good, presenting a challenge to the imagination, skill and energy of American business—a challenge which will be met and out of which will arise a higher standard of living and a better America."

Mr. Phelps explained that he is not blinking his eyes to the adjustment period which is bound to follow the war, but asserted that men with vision and rich red blood flowing through their veins should and will face the difficulties which lie ahead and will develop new uses for material surpluses. This will mean work for more people and solution of the economic problems a war always brings.

Praising the Office of Production Management, he said, "The OPM is a great testimonial to the effectiveness of our free American system of developing and using business brains in a great emergency."

Regarding price levels, the speaker said, "Our problem of readjustment after the war will be much simpler if prices are not inflated far beyond normal levels."

first — investigate the possibilities of
JESSOP WASHINGTON CARBON TOOL STEEL

The present demand for alloys for use in National Defense makes it more necessary than ever before to use straight carbon, water-hardening tool steels in every case possible.

TYPICAL APPLICATIONS
Cold Striking Dies, Threading Dies, Blanking Dies and Punches, Cold Forming Dies, Knives, Razors, Shear Blades, Wood Chisel, Drills, Taps, Reamers, etc.

For unusually severe service—where a first quality carbon tool steel is needed—you can be sure of dependable performance by specifying Jessop's WASHINGTON. Standard shapes and sizes are stocked in our various warehouses and at the mill for immediate shipment. For price quotation and delivery dates, write JESSOP STEEL CO., 603 Green St., Washington, Pa.

JESSOP STEEL CO. FINE JESSOP STEELS WASHINGTON, PA.
1901 CELEBRATING OUR 40TH ANNIVERSARY 1941
Jessop Steels of America
CARBON · HIGH SPEED · SPECIAL ALLOY · STAINLESS · and COMPOSITE STEELS

Hammond 6″ Carbide Tool Grinder

A new Carbide Tool Grinder using 6″ Silicon Carbide or Diamond wheels has been developed by Hammond Machinery Builders, Inc.

The new machine, first in a series of three soon to be completed, stresses heavier, machine-tool construction for additional strength and sturdiness demanded by present production schedules.

Highlights include:—(1) Extra-heavy tilting tables, easily removable. To install new wheels, a single clamp releases table which may be slid off the 1¾″ supporting shaft. (2) Tables are slotted for protractor angle-guide furnished with machine. (3) Inside edge of each table is machined inward at an angle to permit tilting without necessitating readjustment of distance between table and wheel. (4) Cast-iron support under each table serves also as a sludge pan and is easily removed and cleaned by releasing same clamp that locks tilting table to supporting shaft. (5) For accuracy in

SPIN YOUR RIVETS THE LOW COST WAY

use

LINLEY Noiseless Riveting Machines

Sturdy, fast, easily operated! Put your production rivet spinning jobs on Linley Riveting Machines and watch your costs come down.

We are glad to demonstrate the quality of work that can be turned out. Send us samples of your parts and you'll be impressed with what you can do and how little it will cost you. Sizes and types available for iron or cold rolled steel rivets up to 3/8" with capacity for larger rivets of softer materials.

Send for descriptive literature.

LINLEY BROTHERS CO.

11 Mountauk St., Bridgeport, Conn.

Hartford Bench Taper Gage

This gage has been developed to not only meet tool-room requirements, but manufacturing requirements.

It is made in a most substantial manner of the best materials. The gage plates are hardened and ground. In operation the gage sets on a bench convenient to the workman. It is adjusted to the height of his eyes, and placed so that he looks toward the light through the gage. The gage plates are set to a master plug gage. It is found much more accurate and rapid to operate than a ring gage.

Height to center line of gage: greatest, 30¼ in.; least, 23¼ in.; weight, 23 lbs.

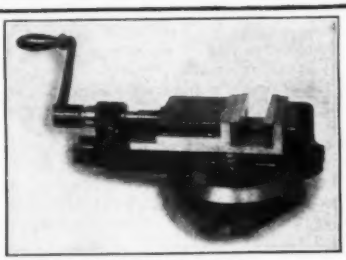
Capacity—From nothing to No. 14 Brown & Sharpe taper.

Built and sold by

The Hartford Special Machinery Co.

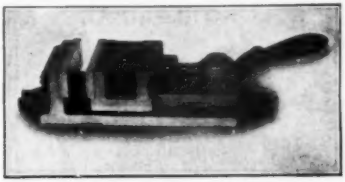
HARTFORD, CONN.

The Modern Swivel Vise



Base graduated in degrees
Alloy steel hardened screw
Hardened & ground jaws
Made in several sizes
Weight 36 pounds
List Price $40.00

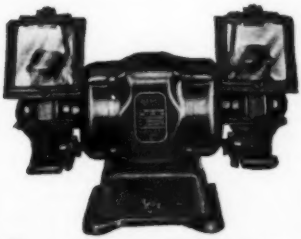
The Modern Quick Acting Cam Vise



All steel parts hardened
Hardened alloy steel screw & handle
Hardened & ground jaws
Semi Steel castings thruout
Made in two sizes
Weight 20 pounds
List Price $35.00

Manufacturer of high speed steel and carbide cutting tools.

MODERN TOOLS, INC. E. BERLIN, CONN.



THIS GRINDER
Guaranteed 2 Years
AGAINST BURN-OUT

BALDOR GRINDER No. 612 has Capacitor Type 1/3 HP Motor guaranteed 2 years against burn-out. 3440 r.p.m., 110 volt, 60 cy., single phase. 6"x3/4" wheels; enclosed guards; adjustable eye shields; tool rests adjustable vertically and horizontally. Net weight 46 lbs. **$33.50**

The COMPLETE LINE of BALDOR Grinders (bench and pedestal types) described in BULLETIN 89. Ask for it.

BALDOR ELEC. CO.
4368 Duncan Ave.,
ST. LOUIS, MO.

BALDOR
BALL BEARING **GRINDERS**

EXCELSIOR No. 14 ANGLE ROLLING MACHINE

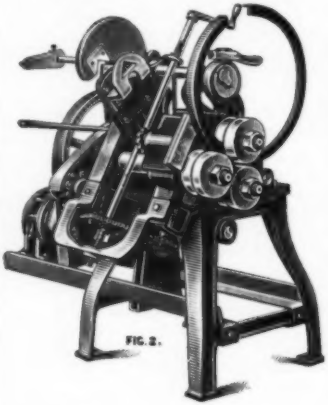


FIG. 2.

Capacity 2x2x¼" Angles. All the rolls are direct driven avoiding slipping of the material between rolls, which are operated by the oversize Excelsior friction clutch. Write for Price and Testimonials.

We specialize in Automatic Grinding and Polishing Machines, to polish Stainless Steel Sheets, Automobile Bumpers, and parts, Stove and Range Top Castings, Electric Iron Sole Plates, etc.

Also Inside Cutting Shears, Deep Throat Power Punches for duplicate work by the use of horse shoe templets up to No. 12 gauge. Used in Stove, Range, Air Conditioning and Kitchen Equipment Plants.

EXCELSIOR TOOL & MACHINE CO.

East St. Louis, Illinois

grinding angles, a plainly marked indicator, ranging from 0 to 25 degrees is mounted directly beneath each table. Tables tilt to exact angle of adjustment easily, sliding on machined quadrants. (6) Motor is heavy duty type, ½ h. p. 3450 r. p. m. with oversize, precision ball bearings and mounting Silicon Carbide wheels 6" x 1½" x 1¼" or Diamond Cup wheels 6" x ¾" x 1¼". Motor is reversible for right or left hand grinding, controlled by switch at front. Brake is built-in. (7) For wet grinding, an integral wheel guard and coolant tank, (illustrated) may be substituted easily for standard cast-iron wheel guard. Coolant is carried to wheel by a copper tube. Needle valve controls flow.

A New Gage Producer

The Atlantic Instrument & Tool Co., Inc., 418 Broome St., New York City, has just been organized for the manufacture of precision measuring instruments, adjustable snap gauges and other tools. The snap gauges are being made to American Gauge Design Standards and are now in production.

In addition, the Company maintains a department for special work that can be produced on fine precision lathes, and is already making parts for a nationally known plant engaged in the manufacture of instruments for the defense program. The equipment includes the most modern inspection and measuring devices to guarantee the production of work to very close tolerances.

NEW!

Abrasive sheets, ribbons and discs with adhesive backing—no glue required. Instantly applied for sanding, lapping, polishing, finishing, etc. Economical and a real time and labor saver.

Write for details.

MUTUAL ENGINEERING COMPANY

326 W. Third St., Davenport, Iowa.

Flight

Two new books on aviation are offered by the American Technical Society, Chicago, at $2.50 each.

"Flight — First Principles" contains 288 pages and is copiously illustrated with 414 photographs and drawings.

Written by practical men who know their subjects, this volume starts with a popular outline of the history of transportation, with special emphasis on aviation. The next section is in the form of an illustrated glossary including all parts of the plane.

A section is devoted to the theory of flight—an absolute necessity to anyone who wants to understand aviation. All information is based on something which the reader already knows and proceeds to advanced work step by step. Two interesting and illuminating sections are those on soaring (gliding) and parachutes—their construction, types of packs, etc.

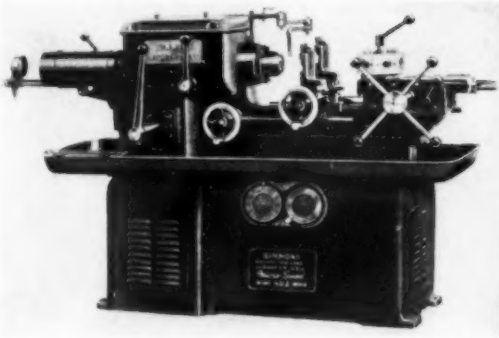
"Flight — Construction and Maintenance" is of similar size and format and also contains a large number of illustrations. This work starts with a section on blueprint reading including principles of the working drawing, definitions of machine shop terms, drafting room practice in avaition, and reading aviation drawings. The next section deals with woods used in airplane construction and detailed requirements for such use. The following section discusses elementary metallurgy, including testing of metals, shaping and forming, etc.

The treatment of oxyacetylene welding includes the types and use of equipment, chemistry of flame, manipulation of the torch and welding rod, and the welding of aluminum, steel, and stainless steel.

The remaining sections cover construction, rigging the airplane, repairing the airplane, and propellers.

GITS
CONSTANT LEVEL OILERS
unbreakable
FIXED CONSTANT OIL LEVEL—is your protection against varying oil levels resulting from tampering and vibration.
Incorrect oil levels cause burned out or flooded bearings. Overcome this trouble with GITS constant oil level oilers.
Complete details furnished upon request.
GITS
FILL THROUGH BOTTLE NOZZLE
CANNOT BREAK. BOTTLE NOT MADE OF GLASS
ALWAYS FILL HERE
EXCLUSIVE FEATURE. BOTTLE HINGED TO CUP. PATENTED
BOTTLE WILL AUTOMATICALLY RETURN TO ITS CORRECT POSITION AFTER FILLING
OIL LEVEL ALWAYS CONSTANT
GITS BROS. MFG. CO.
1860 South Kilbourn Ave. Chicago, Ill.
30 years of oil cup experience

Simmons Micro-Speed Improved



Several improvements are incorporated in the latest model Simmons Micro - Turret Screw Machine. The head is equipped with a brake for the spindle, for instantaneous stopping under all operating conditions. A cabinet base is now provided, in which is mounted the electrical equipment, with a selector dial control.

This dial is immediately on the front within instant reach of the operator. It controls the micro-speed drive unit which offers a multiplicity of spindle speeds through the multiple Vee driving belts. This machine is built in plain and back geared types by Simmons Machine Tool Corp.

BUILD YOUR OWN MOTOR DRIVES

IN YOUR OWN SHOP AT LOW COST

We Furnish

- Castings
- Drawings
- Constructions

MODERNIZE Lathes—Milling Machines

Turret Lathes—Screw Machines

Send for illustrated descriptive circular and specification sheet.

H. A. ESENWINE

1961 So. Santa Fe — Los Angeles, Calif.

Ryerson Improves Buyers Guide

The 1941 Stock List recently published by Joseph T. Ryerson & Son, Inc., is the largest and most complete steel buyer's guide ever published by this Company. New products, new analyses, and new sizes plus an increased number of helpful charts and tables combine to make this 268 page Stock List a most important addition to every Steel Buyer's reference file.

In addition to a complete listing of all Certified Steel products carried in stock by Ryerson, the book contains SAE standard specifications, a physical properties chart showing machinability of more than 50 steels, standard gauge comparisons, weight tables, and other helpful data.

Larger, easier-to-read type heads the list of mechanical improvements made in the new List. Other features include an enlarged complete main index, handy thumb tab margin indexes, helpful sub-indexes on all tab pages, "eye-conditioned" paper, and a mechanical binding that assures flat, easy-turning pages.

The book is published in 10 editions—each giving a complete description of the wide range of Certified Steel products carried in stock by one of the Ryerson Steel Service plants.

Kindly use your business letter-head when requesting copies.

"A Good Mechanic Seldom Gets Hurt"

Practical, specific hints for machine shop safety are outlined in the recent book titled "A Good Mechanic Seldom Gets Hurt." Vague generalities about safety are avoided and the emphasis is on specific machines and operations.

This 92-page, spirally bound book has chapters or sections covering — arbor press, babbitting, hand tools, forge and furnace work, the drill press, the lathe, welding, and many other safety discussions of vital interest to machine shop or toolroom.

There are many helpful photographs of the various machines showing what-to-do and what-not-to-do in handling them. The book has been written after years of experience and experiment by Herman R. Graman, machine shop instructor.

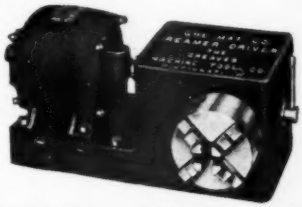
The book is published at fifty cents by the American Technical Society, 850 E. 58th St., Chicago.

Fellows Involute Measuring

An attractive and informative bulletin issued by the Fellows Gear Shaper Co., Springfield, Vt., describes their involute measuring machines.

The principle employed in these machines is based on the use of a master involute cam developed from a larger base circle than the maximum capacity of the machine. When an electric recording device is used, any deviations from a straight line indicate a departure from the theoretical profile.

Only $138.50 Buys This

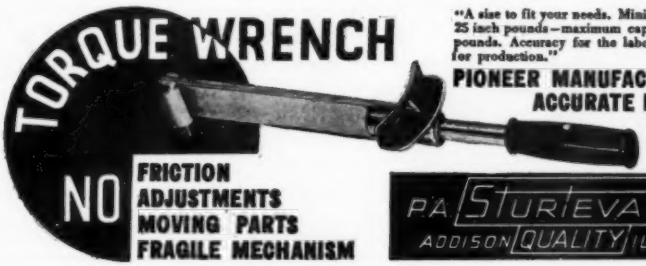


GREAVES REAMER DRIVE

- Cuts reaming time in half
- Assures smooth, accurate holes
- Complete with motor & foot switch
- Capacity up to 1½"

Write for circular

GREAVES MACHINE TOOL CO.
CINCINNATI, OHIO

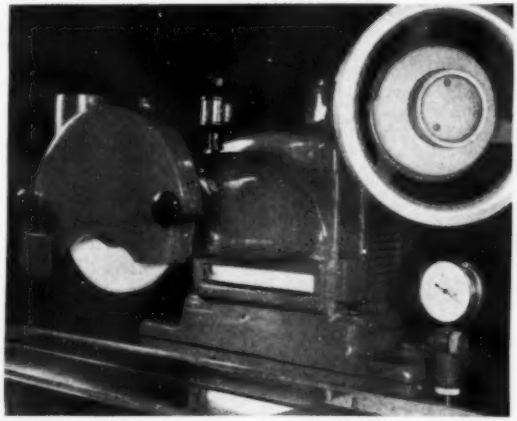


"A size to fit your needs. Minimum capacity 0 to 25 inch pounds—maximum capacity 0 to 600 foot pounds. Accuracy for the laboratory—sturdiness for production."

PIONEER MANUFACTURERS OF ACCURATE MEASURING WRENCHES

PA STURTEVANT CO.
ADDISON QUALITY ILLINOIS

"Doall" Grinder Offers Advanced Features



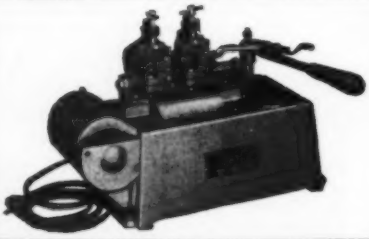
Details make perfection, but perfection is no detail. An example of this old adage is to be found in the new "Doall" Precision Surface Grinder. The rigid standards of accuracy demanded by the Army and Navy in the present rearmament program brought to light a definite lack of a precision grinder which would "split that last tenth" or 'grind flat to 4 RMS finish." The manufacturers anticipated this demand by two full years.

Illustrated is the all-important spindle head of this machine. Super precision ball bearings carried in a ground heat treated forged SAE 3140 quill make up the "heart" of the spindle head assembly. The lapped spindle hole through the spindle head assures a proper fit.

Included in the spindle head assembly are several exclusive features, such as built-in flush type lighting, directed where it is needed; dial indicator giving direct measurement between wheel and work in tenths; an adjustable dust or splash guard which can be set close to the work and adjusted as the wheel wears. The wheel guard rotates and can be locked in any position when using a tangent - to - radius wheel dresser. The handwheel is graduated in half-thousandths and has an auxiliary vernier adjustment for feeding in tenths. The handwheel is finished in dull chrome with enamel filled graduations—assurance against rust from perspiration or coolant. The dull chrome finish also makes an ideal surface to mark settings with a lead pencil.

Plaskon Resin Glue

A handsome bulletin in color has been issued by Plaskon Co., Inc., Toledo, Ohio. It covers the development and uses of Plaskon Resin Glue with photos of various stages of plywood manufacture. Examples of fine furniture are shown; also a laminated propeller and a nine foot dinghy made in one piece by the Vidal process.



BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded.

1 KVA—110 Volt—60 Cycle—single phase—5 point heat control—1 point anneal heat—Weight 40 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

WELDEX INC., 7325 McDONALD AVE., DETROIT, MICH.

Blueprints

"Machine Trades Blueprint Reading" is the title of a book just published by the American Technical Society, Chicago, at $2.00.

Its authors are Messrs. Russel W. Ihne and Walter E. Streeter. Ihne is Assistant State Supervisor of Industrial Education for Indiana. Streeter is an Industrial Engineer with the Aluminum Co. of America.

This book is the product of years of experience both in the shop and in training classes. It has actually been tested by two years of classroom work and has been revised in the light of that experience.

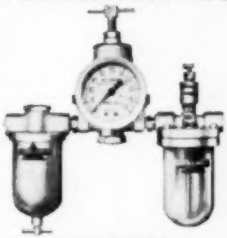
"Machine Trades Blueprint Reading" begins with fundamental principles and in a step - by - step manner proceeds to actual production blueprints. The prints used have been taken from actual manufacturing work. These are very similar to real blueprints, incidentally white lines on the familiar deep blue background. A few of these prints open out to twice the 8¾ x 11" page size; one is eight times as large as a page.

The first part of the book has been designed to teach all the basic information necessary to interpret a print. It covers the alphabet of lines, the methods of projection, relationship of views, and an understanding of dimensions. A glossary of shop terms with illustrations is a helpful feature of this book.

The problems in shop arithmetic have been introduced to review their application to the checking of dimensions. This practical use of the elementary functions of arithmetic should bring out clearly the extent of the reader's understanding of this important subject.

There is a question sheet to accompany each blueprint with space for writing in the answers.

USE AIR AT ITS BEST!



NORGREN

Lubro-Control

UNITS

. . . feed your air tools *clean* air, *controlled* air, and *oiled* air which lubricates every tool in your plant, automatically. The 60,000 lubricators in use have proved that Norgren Lubricators will cut your oil and repair costs 75%!

Filter stops scale, impurities, and excess moisture. The *Regulator* delivers exactly the right pound-push for perfect performance—without fluctuation. And the Sight-Feed Lubricator completes the air preparation with a fog of oil. No waste. Prevents rust. Cuts repairs. Steps up production-per-tool.

There is a Norgren air cleaning, lubricating, and control assembly for every place air is used in industry.

CATALOG 400.

C. A. NORGREN CO.

234 Santa Fe Drive

DENVER, COLORADO

Rapid Production of Small Parts
Nilson Foot and Power Presses

For greater production on a variety of light work, here is a lighter and more efficient press. Pedal is accurately balanced and with an easy swinging motion, an effective blow is easily produced.

These Presses are designed for rapid production of small parts. The operator is relieved of actual labor and his work is merely control of a semi-automatic machine.

Safety clutch is provided which absolutely prevents repeating, regardless of whether or not the treadle is released. By turning a handle the press is instantly converted into a continuously running machine.

Our No. B O Foot Press and No. B 2 Power Press are shown. We also manufacture a No. B 3 Power Press which is larger and more powerful. Our Power Presses can be equipped with toggle feed, dial feed, or wire straightener and former.

Let us send you complete details.

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

New Grinder for Small Races

A new Landis No. 1 Race-a-Way Grinder is intended for smaller outer races up to and including the No. 204 size. Double row races may also be handled.

It is equipped with the Landis-Solex sizing device which in combination with an electric timing control permits three operations during the same grinding cycle. The race is rough ground up to the point where only a small amount of stock remains to be removed. Grinding continues, but at a slower grinding feed which is equivalent to what would ordinarily be the finishing operation. With work practically to size, grinding feed and work head oscillation stop. The work head is centered and for a fixed but exceedingly brief period of time the wheel sparks out until work is down to exact size.

The entire grinding cycle is automatic once it is set in motion. The operator merely loads the work and depresses start button.

A basic feature of design is the Landis-Solex sizing device which may

Join The Chain Making Gang
Nilson Chain Making Machines

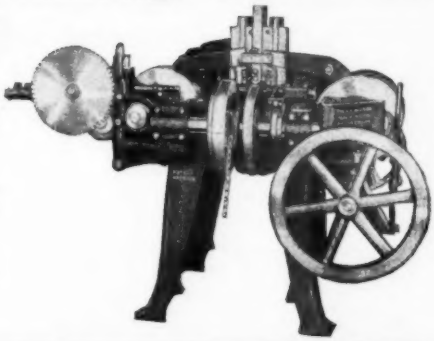
To make a full line of standard size chains as known to the trade, Nilson makes the four necessary sizes of machines. The chains made by these machines are strong, durable, safe and flexible.

The most important feature of the chains made by these machines is that ends are tucked in, making them perfectly smooth on both sides, and increasing the tensile strength 20%.

These chains are smooth to handle and will run through the hands without injury. They will run accurately on sprockets for conveyors or power transmission purposes.

We also make machines for forming the straight welded chain, for twisting the chain, and for forming the cross chain and hook.

Send for our bulletin today.



The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

be furnished in the compensating type or the finger type. The former is used with races having a groove diameter less than 7/8" and controls size of each race ground by compensating automatically for any slight error found on the race previously ground. The latter is considered extra equipment and is used only with races having a groove diameter of 7/8" and up.

The wheel spindle operates at 50,000 r. p. m. This high speed is required so that the exceedingly small wheel used will produce races rapidly. The spindle is of exclusive design, utilizing super-precision ball bearings and stands up for long periods under the severe duty. If machine is intended to grind only the larger races having 7/8" groove diameter and up, a 30,000 r.p.m. wheel spindle is supplied instead.

All mechanism is enclosed, yet readily accessible. Coolant flow may be stopped automatically during finishing portion of cut, resumed as wheel backs away from work and stopped again at end of cycle. Or coolant flow may continue through to end of cycle.

A master safety button stops every machine movement. Super-precision ball bearings carry work spindle and work head has lateral movement on its slide, permitting ready use for double row races. A hydraulic mechanism causes wheel base to reset itself automatically at end of each grinding cycle, the amount of reset being adjustable and being equal to amount of stock removed from each race. Hydraulic power is used to move wheel base into and out of grinding position.

Standard equipment includes complete electrical equipment and everything required for grinding of raceways within capacity of the machine excepting work holding chuck. The Landis diaphram chuck is recommended and may be had in two sizes. The first is suitable for races having an O.D. of 3/8 to 1-3/16", while the second will take in the 1-3/16 to 2" range. Suitable provisions permit connection to a central coolant system, or a coolant supply unit may be had at extra cost.

Net weight, including electrical equipment, is 3500 pounds. Floor space required is 35" x 41".

TO INSTRUCT NEW MEN IN THE HANDLING OF

DIAMOND TOOLS

we will send you a valuable booklet. No charge, no obligation.

KOEBEL DIAMOND TOOL CO.
9352 Grinnell Ave., Detroit

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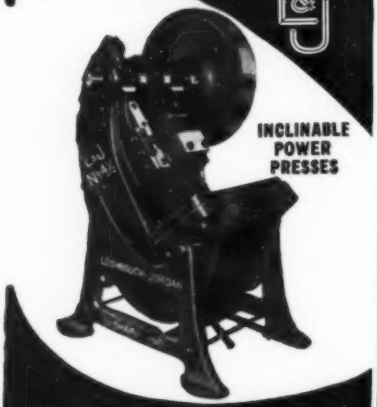
DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for all Industrial Purposes.

Standard Since 1911

L & J



INCLINABLE POWER PRESSES

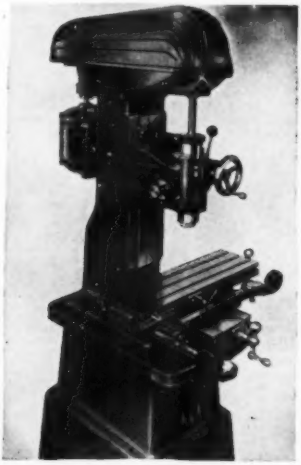
L & J PRESS CORP.

Successors to Lochhoven-Jordan Tool & Machine Co.

1625 STERLING AVE ELKHART, INDIANA

Vertical Mill and Jig Borer

Recently introduced by Machinery Mfg. Co., the Vernon Vertical Mill and Jig Borer is claimed to be the only tool in its price range on which Dial Indicators and Measuring Rods can be furnished as a standard extra for jig boring operations.



Where both large and small jig boring jobs are done in a shop, this relieves larger jig borers, permitting the smaller jobs to be turned out speedily and economically. The standard set consists of the two Dial Indicators with jewel bearings, 1" range, double dial and tell-tale hand. The dials are large and easily read, being 2¼" in diameter. Graduations are in .001" and the ample space between graduations permits "visual splitting." There are seven assorted sizes of Measuring Rods, 1" to 4" in length, and necessary troughs are provided for holding and attaching this equipment.

Every unit is equipped with two feeds to Quill—fine feed by means of hand-wheel and rapid one-to-one traverse with hand-lever. The spindle is mounted in pre-loaded, ultra-precision

For Low Cost Dead Record Storage

STEEL TRANSFER CASES

Heavy steel 1"x⅛" bar completely encircles case front and rear—24 ga. drawer and case—Case has solid sides, back and top to keep out dust—Steel bar legs—Heavy bar pull—Pressed label holder—Drawer stop for safety—Interlocking feature permits stacking without the use of screws, bolts or tools—Olive green baked on enamel.

No. 45 LETTER SIZE CASE

CASE SIZE—13" W x 11⅜" H x 25" D
DRAWER CLEARS—12 3/16" W x 10½" H x 24½"D

Write for Additional Sizes and Styles.

$2.04 Each *Packed Two to Carton (Minimum Order.) Quantity Prices on Application.*

Prices F. O. B. Cleveland, Ohio

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2352 East 69th STREET, CLEVELAND, OHIO

SHELVING • LOCKERS • CABINETS • FILES • DESKS

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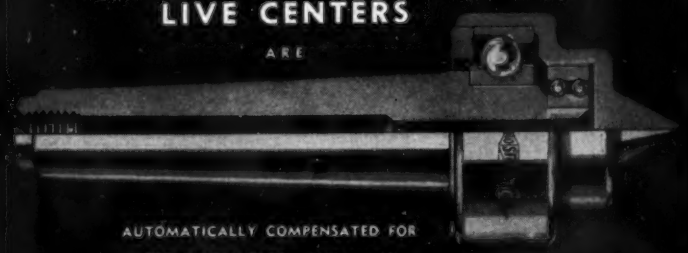

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ARE ACCURATE, DURABLE

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STURDIMATIC TOOL COMPANY

5224 THIRD AVE. • DETROIT, MICH.

GS TOOL CHESTS

GS TOOL CHESTS are designed for the safe-keeping of valuable precision tools and the convenience of machinists and toolmakers. Write for bulletin showing various types and sizes available. Quick deliveries

Geo. Scherr Co.
122 Lafayette St.
New York, N. Y.

Lead screw ground from the solid AFTER hardening

CRITERION *Boring Head*

SMOOTH and compact. Constant accuracy. Parts subject to wear are hardened. Large offset adjustment eliminates need for offset boring bars. Lead screw is hardened tool steel. Its threads are ground from the solid AFTER hardening.

Criterion heads are unexcelled in accuracy, in ability to withstand constant use. Two sizes 1¼" and 3". ½" and 1" bar capacity. Order from your dealer or write direct. Request free literature. No obligation.

CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

ball bearings, collet end of spindle being carburized, hardened and ground and there is a wide range of spindle speeds. Cross and longitudinal screws are mounted in ball bearings for easy accurate operation. Adjustable beveled dials, accurately graduated in .001", in all feeds. Micrometer Depth Stop and Direct Reading Scale came with quill; and quill, sliding head, table and saddle have independent locks. Other features include balanced drive pulleys, mounted in sealed ball bearings and fully enclosed in helmet head; tapered gibs throughout; both longitudinal and cross nuts with take-up adjustment for wear.

Weldwood Manual

A new 20-page Manual of Weldwood Plastic Resin Glue has been issued by United States Plywood Corp., 616 West 46th St., New York, N. Y.

This adhesive is easily mixed in cold water, is ready to use immediately after mixing and is applied cold and asserted to be waterproof.

Weldwood is stain-free and may be used on delicate veneers without "bleed." Many uses are described including use as sizing, as waterproof wood putty, for aircraft and marine work and for furniture. Explicit directions are given.

Safe Sling Practice

An interesting new bulletin on the safe use of slings has been issued by Macwhyte Company, 2902 14th St., Kenosha, Wis.

Typical designs of slings are shown with full descriptions and a sling load chart is included.

The First Step in Defense Production

Milliken Bench Plates and Angle Irons

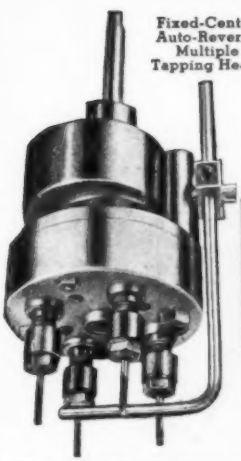
In laying out work and setting up most machines you will find the adaptability and accuracy of Milliken plates and irons indispensable. Priced to appeal to every machine shop operator. Shipments from stock. Write now for specifications and prices.

Milliken Machine Company
23 Prospect Place, West Newton, Mass.

ERRINGTON MECHANICAL LABORATORY

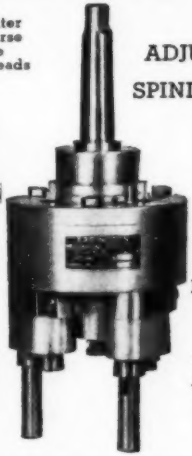
STAPLETON, STATEN ISLAND, N. Y.

MULTIPLE HEADS



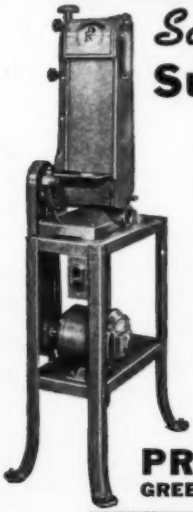
Fixed-Center Auto-Reverse Multiple Tapping Heads

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD



All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

Super-Sensitive Fixed-Center Multiple Drilling Heads



Save Time Burring Surfacing and Polishing

Adjustable from vertical to horizontal position within a few seconds, the No. 608 Production Abrasive Belt Surfacer is capable of large output. It saves time burring, surfacing and polishing plastic moulded products, rubber, wood, pressed steel parts, die castings, iron, steel, etc. Ball bearing equipped throughout. Work or belt table is 15"x6". Abrasive belt is 50" long x 6" wide. Work gauge is adjustable to any angle and removable. Other sizes 4" to 20" width of belt. Vertical and Horizontal. Also Reed High Speed Sensitive Drills.

Send for bulletin TODAY.

PRODUCTION MACHINE CO.

GREENFIELD MASSACHUSETTS

PROMPT DELIVERY

DYER

Heavy Duty Spot Welders

Dyer Welders are available in a wide range of sizes and capacities—air or foot operated, giving maximum production—simplicity of operation—power economy.

Floor models 10 to 35 KVA.

6 point selective switch on all floor models allows for quality welds on various materials. Standard and Underwriters Labeled Machines.

3 point switch on bench models.

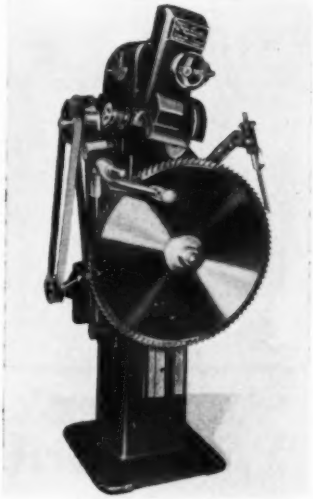
Bench models 2½ to 10 KVA—with or without pedestal.

Few Territories Available.

The Topeka Foundry & Iron Works Co.
300-332 Jackson St., Topeka, Kansas

Saw Grinder and Segmental Saw Blades

The Motch & Merryweather Machinery Co. offers a new No. 1 Automatic Saw Grinder for sharpening its segmental saw blades used in connection with No. 3 and No. 4 Hydraulic Cold Sawing Machines.



Rigid construction and automatic indexing provide for rapid, accurate sharpening. Drive is by a single electric motor through belts, completely enclosed. An oil pump provides lubri-

CARROLL CLUTCHES

DISC TYPE "CP" for Countershaft Service.
TYPE "CE" and "CEE" for Sleeve and Vee Belt Drives. Mechanism only can be procured by manufacturers incorporating Clutches into their own mounting for Vee Belt Drive. They have drag free idling at any speed. *Write Today.*

L.W. Carroll Mfg. Co.
2946 Ross Ave., (Norwood) Cincinnati, O.

cant to all internal moving parts. The wheel spindle and wheel slide are located in the same plane, eliminating overhang and minimizing vibration. Accurate pitch is effected by an indexing disk. High speed for fine pitches and small-diameter saws, and slow speed for larger saws are accomplished through sliding gears. Alternate high and low teeth can be ground in one setting by merely positioning a lever. All operating controls can be actuated while grinder is running.

The Saw Blades are segmental in type. The tooth pitch can be suited to any material. Segments of high grade tool steel are fitted to a heat-treated center. They project slightly to protect body of blade from rubbing. Teeth are ground to a special form to afford favorable cutting conditions. The segments form a closed ring which stiffens the blade and lends additional strength. After the segmental teeth are completely worn, the main blade can be re-set with new segments without any reduction in diameter. The segments are machined to gauge and can be readily exchanged.

An 8-page bulletin describes the No. 3 and No. 4 Sawing Machines, as well as the new No. 1 Automatic Saw Grinder and Segmental Type Saw Blades.

K. O. Lee Bulletin

An unusual broadside is offered by K. O. Lee Co., Aberdeen, S. D., manufacturers of tool grinders and other products. The names of many of their users are listed in geographical order, showing how numerous and how widely scattered they are.

MODERNIZE present equipment with a RUSSELL BORING BAR. Bores 9/16' to 12' dia. with boring axis parallel to shank axis. One compact tool, with micrometer adjustment.

RUSSELL BORING BAR CO.
MIDDLETOWN, OHIO

HOCUT
Wets Out Faster—

● It's No. 1 in the Hit Parade of Water-Soluble Cutting Oils. Look at the other oils photographed on a polished steel surface. They lack the wetting-out ability of HOCUT, which enables our oil to get in rapidly and do a real cooling job. Speeds and feeds can be increased for that reason, without sacrificing fine finish. HOCUT forms a stable transparent emulsion — no gumming. Try a drum and be convinced.

Write—

●

E. F. HOUGHTON & CO.
Chicago • PHILADELPHIA • Detroit

Houghton's Soluble Cutting Oils

BUY WHITNEY-JENSEN
METAL-WORKING MACHINERY and HAND TOOLS
for LONG LIFE and ACCURACY

12-14-16 ga. 4-5-6-8-10 ft. sizes

ROLLER BEARING BRAKES

Combination type, for box and pan as well as all types of straight bending. 30% easier on the operator. Hardened jaws for stainless steel.

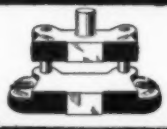
OVER 80 USEFUL ITEMS

in the Whitney-Jensen line. Punches, shears, brakes, rolling machines, etc. *Send for new Catalog No. 14.*

WHITNEY METAL TOOL COMPANY

235 FORBES STREET • ROCKFORD, ILLINOIS

BAUMBACH



STANDARDIZED
Machined Steel **DIE SETS** Semi-Steel

Drop Forged Steel

Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die service that is unsurpassed. Let us prove it!

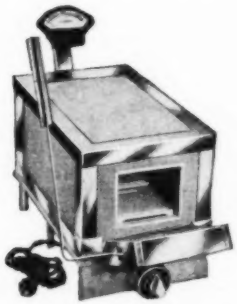
Send for our new 336 Page Catalog.

E. A. BAUMBACH MFG. CO.

1810 So. Kilbourne Ave., CHICAGO, ILL.

Small Heat Treating Furnaces

A line of electric furnaces for laboratory and heat treating purposes is offered by Huppert. The "Universal," for example, incorporates a seven point control which cuts into the heat range selected for definite control of temperature.



Three heat ranges are offered with this furnace:—low, 0 to 500° F.; medium, 500 to 1000°; and high, 1000 to 1800° F. A built-in temperature control resistance is employed. The "Universal" is provided with pyrometer and porcelain tray . A shelf is also available which increases the capacity of the furnace in treating small pieces.

Inside dimensions are 4½" wide, 3⅝" high, and 4½" deep. Maximum load for high temperature is 1100 watts; minimum load is 220 watts.

CLIMB CUTTING

Possible with Hydraulic Power Feed on the Armor

Milling Machine. Reduces cutter mortality 20%.
Countless Table Speeds available—at finger tips.

Write for bulletin 4B

Aircraft Machinery Corp.
Burbank, California

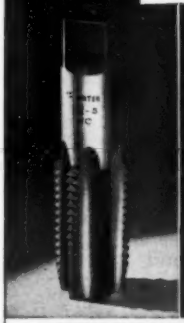
RECLINABLE POWER PRESSES

We manufacture a complete line of mechanical power presses, with sizes and types for every need in your shop.

Write for bulletins.

ZEH & HAHNEMANN CO.
Newark, New Jersey

Winter TAPS & DIES

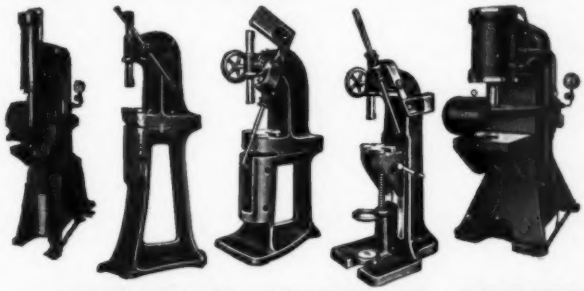


Manufacturers of Hand, Machine Screw, Chip Driver, Pipe, Nut, Stove Bolt, Boiler, Pulley, Staybolt, Tapper Taps, Serial Sets, Interrupted Thread, High Speed and Alloy Steel Taps, Ground Thread Taps.

Also a complete line of Round Adjustable Dies.

THE WINTER BROTHERS COMPANY
WRENTHAM, MASSACHUSETTS
BRANCH FACTORY: DETROIT, MICH.
A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO., DETROIT, MICH.

For AIRCRAFT and MUNITIONS



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GREENERD
The Originators of the Arbor Press
1941

PRECISION WORK IN REARMAMENT

65 Standard Styles and Sizes. Manually operated presses ¼ to 35 tons pressure. Motor driven hydraulic presses 1½ to 30 tons pressure.

Let us send you our catalog No. F.

GREENERD ARBOR PRESSES

NASHUA Est. 1883 NEW HAMPSHIRE

ARMGLO

Manufacturers of Resistance Welders—Foot, Motor, Air and Hydraulic operated.

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Standard and for specific applications with and without electric timing control.

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Bench type filing and sawing machines and abrasive band finishing machines.

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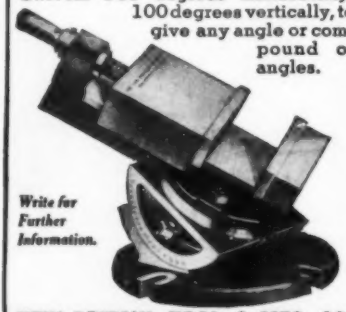
ARMGLO COMPANY
Milwaukee, Wisconsin

New Britain
UNIVERSAL VISE

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.



Write for Further Information.

NEW BRITAIN TOOL & MFG. CO.
NEW BRITAIN, CONN., U. S. A.

Collet Chuck for Flexible Shaft Machines

A compact, single purpose collet chuck which can be attached quickly to hand-pieces used on flexible shaft machines has been developed by Stow Mfg. Co., Inc., Binghamton, N. Y. The new suit is furnished in two sizes, one with ¼" and the other with ⅜" chucking capacity.

The new attachment is made in two styles. With the straight-threaded, hex-head stud, the collet chuck interchanges with the clamp spindle on the standard hand-piece. With the tapered shank it fits into the tapered socket of the high-speed hand-piece, a type used with rotary files, mounted points or other high-speed tools, to assure true running on precision work.

The tapered type of collet chuck will also fit a tool post attachment for grinding operations with a lathe.

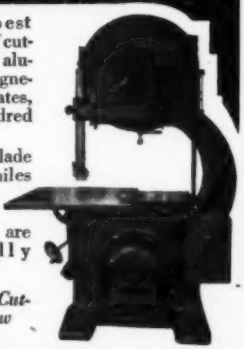
Marking Steel Parts

For speedy numbering with a tool that will withstand continuous hammer blows sufficient to mark steel parts and castings, a new hand style heavy duty Hercules Holder has been developed. It is made entirely of a selected shock

TANNEWITZ *High Speed* METAL CUTTING BAND SAWS

Fastest and best known means of cutting sheet steel aluminum and magnesium sprues, gates, risers, and kindred items.

Provides sawblade travel of over 2-miles per minute with PERFECT SAFETY. Cuts are exceptionally smooth.



Write for Metal Cutting Band Saw Bulletin.

THE TANNEWITZ WORKS
GRAND RAPIDS, MICHIGAN

NOTHING TAKES THE SHOCK LIKE RUBBER

THAT'S WHY THIS DIRECT DRIVE COUPLING IMPROVES PERFORMANCE OF RESILIENTLY MOUNTED MOTORS

Features rubber cushion, made with *exclusive* oil-resisting treatment. Gripped permanently by die-cast ends.

Custom-made in various degrees of flexibility, engineered to job. Splined sleeve or standard types. Made any length from 2-1/2" up. Bores 5/16", 3/8", 7/16" and 1/2". Amazingly simple construction. No parts to get out of order, become noisy, or need replacement. More than a half million in service.

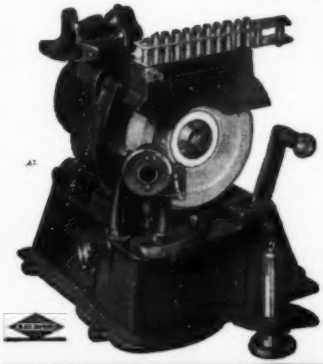
SAMPLE FOR TESTING ON REQUEST

GUARDIAN FLEXIBLE COUPLINGS
209 E. MICHIGAN ST.
MICHIGAN CITY, IND.

SAWS BLACK DIAMOND TOOLS

Grind *Your* Drills On "BLACK DIAMOND" Precision Drill Grinder

SAWS BLACK DIAMOND TOOLS

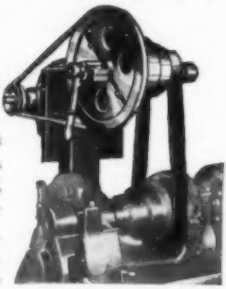


Even an unskilled operator can do a precision job of drill grinding—handles sizes from No. 60 wire gauge to ¾"—easily, quickly and without any complicated adjustments. Saves time, drills and possible damage to the work.

Let us send you Bulletin No. 121-H.

BLACK DIAMOND SAW & MACHINE WORKS, INC.
NATICK, MASS.

GUARANTEED FOR 5 YEARS



When you purchase a STEEGE Drive for your lathe, shaper, miller, etc., you're protected by our broad 5-year guarantee.

STEEGE Drives are easily installed—prices $35.00 up—sent on 30 days' approval. *Let us send catalog.*

W. L. STEEGE MACHINERY CO.
(Our 23rd Year)
548 W. Monroe St., Chicago, Ill.

IF YOU USE TAPS YOU NEED

WALTON TAP EXTRACTORS

The price of a new tap is nothing, compared to the cost of removing the broken one by any other method. WALTON BACKS it out; saves the thread (and your time.)

Stock sizes 4 to 1½" in 2, 3 and 4-flute styles. Sent on 30 day free trial. Booklet 131 gives details and prices. Write for it today.

The Walton Co.
95 ALLYN STREET
HARTFORD, CONN.

resisting tool steel with the head drawn to prevent peening and dangerous mushrooming. The thumb clip that holds the type is also made of steel and formed to shape holding the type by its oversize shoulder.

The steel type is made of a shock resisting tool steel. Each character is machine engraved by modern three dimensional engraving equipment and carefully hand finished and hardened by modern controlled methods.

The extra body to the type not only gives it a shoulder for holding in position but gives extra strength where needed.

Before announcing, the Holder was tested on the hardest jobs, one of them numbering automobile chassis for more than a year. These new tools are now available in all commonly used sizes and can also be made for special conditions such as marking in curved lines and on cylindrical surfaces. They are made by The Acromark Corp.

New Rockford Over-Center Clutch

The Rockford LMC Clutch is announced by the Rockford Drilling Machine Division, Borg - Warner Corp., Rockford, Ill. This toggle-type, over-center clutch is applicable to tool grinders, saws, pumps, farm machinery, lawn mowers, conveyors, hoists, and many other types of mechanical equipment.

It is asserted that the LMC transmits 1 h. p. at 100 r. p. m. or proportionately smaller or larger h. p. as speeds decrease or increase up to a maximum of 6 h. p.

Simplicity of design and of assembly are stressed. Clutch plates are steel, hardened and ground; toggle parts are hardened steel. Pressure for driving is said to be uniformly distributed and applied directly opposite facing. Bushing needs no oiling.

Cold Header Die Steel

An 8-page booklet just issued by Jessop Steel Co., 603 Green St., Washington, Pa., describes their "New Process" Cold Header Die Steel, a clean, non-porous steel developed especially to meet the severe service conditions encountered when cold-heading bolts, screws, rivets, nails, buttons, and other small metal objects. Complete information on the heat treatment of this steel has been included.

DoAll BAND FILES

TAKE THE PLACE OF MANY HANDS

SEE HOW DoAll File Bands WORK!

For greater speed and accuracy in internal and external band filing, nothing will equal the results obtained with DoAll Band Files, which form an even, rigid file at point of work and automatically unlock to pass smoothly over wheels.

DoAll Band Files come in 3 widths, 23 styles, cuts and sizes.

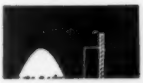
Send for Literature today.

The DoAll Company, Inc.

1206 Thacker St., Des Plaines, Ill.

Associated with Continental Machines, Inc., Minneapolis, Minn.

1 Hour of Hand Filing produces 2 oz. Chips.



1 Hour of Jig Filing produces 4 oz. Chips.

1 Hour of DoAll Band Filing produces 19 oz. Chips.

DO YOU USE MAGNETIC CHUCKS?

Do you have trouble getting the work piece off the chuck QUICKLY after the grinding? Do you have to hammer and pry . . . waste time . . . damage the chuck?

Then you need

NEU-T-ROL

Magnetic Chuck Control to save you time and money

Neu-T-rol RELEASES THE WORK PIECE and DEMAGNETIZES AS IT RELEASES

It speeds up your production
. . . dispenses with damage to chuck
. . . eliminates chuck resurfacing
. . . prolongs life of the chuck
. . . saves operator's energy
. . . prevents injury to him
. . . pays for itself in short order.

NEU-T-ROL Motor-Controlled Unit — for Remote Control, if desired.

WRITE FOR NEW BULLETIN 21

It gives complete information about simple Neu-T-rol installation on grinders in work, or for new grinders before delivery to you.

ELECTRO-MATIC PRODUCTS CO.

Also Makers of Rectifiers

4824 N. KOLMAR AVE., CHICAGO, ILLINOIS

Heat Treating Small Parts

Plants in which the installation of elaborate heat-treating equipment is not warranted will probably be interested in the new, streamlined, Tocco Junior machine of 20 kw. (output) capacity. Just announced by the Ohio Crankshaft Co., it is a specially designed utility unit for heat - treating small parts.

Selling at a new low price, the streamlined "Utility Junior" is offered in two models, one for applications not requiring quenching, such as annealing, brazing, soldering, and heating for forming and forging; the other for localized hardening. In the hardening machine a transformer housing and work pan have been added to the otherwise flat-topped basic 20 kw. unit. The inductor block is attached to the rotatable transformer panel. The variety of small parts that can be heat-treated or surface-hardened on these two units is extensive. Fixtures and coils are designed to meet user's specifications.

Both of the Junior models use the same high frequency motor generator sets, supplying 9600 cycles of high frequency current at 220 volts, and both units have all required control devices.

For local hardening, the 20 kw. is equipped with pre-set, full automatic controls and a suitable hardening fixture.

The new unit stands waist high, occupies only 36x48" of floor space and features rigid, all-welded construction. The cabinet is painted a durable gray enamel. Air filters back up the ventilating louvres to keep out shop dust and grime.

Power consumption of the 20 kw. Junior is said to be unusually low. Installation requires only connection of power lines and water.

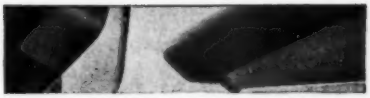
G. E. Plugging Control Bulletin

Plugging control is the subject of bulletin GEA-3571, just issued by General Electric Co., Schenectady, N. Y. This method of quick stopping is said to offer definite savings of time in many operation cycles.

LESLIE HAND PUNCH PRESS
MOST CAPACITY
POSITIVE ALIGNMENT

Max. cap. 2" dia. hole thru 10 ga. iron, proper shear on punch, throat depth 6". Takes punch press dies up to 3"x4½" in area. Leaf arm gives perfect alignment without ways or leader pins. Portable. Price $75.00 F. O. B. Chicago. *Ask your dealer, or write for circular.*

LESLIE WELDING CO.
2947 Carroll Ave. Chicago



Fast Production Needs Correctly Ground Tools!

Grind them on a SELLERS TOOL GRINDER!

More vital than ever before is the need for correctly ground tools and tool bits—for it is only when tools are properly shaped and have the right clearance and rake that they can take heavier cuts at higher speeds for fast production work. Sellers Tool Grinders provide a simple and efficient means of accurately producing correct tool shapes and of *duplicating these shapes on any number of tools.*

To keep in step with today's production demands, you need a Sellers Tool Grinder in your plant.

Write for the new Sellers 4-T Tool Grinder Bulletin.

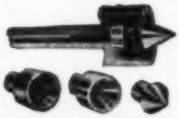
WM. SELLERS & CO., INCORPORATED
1616 Hamilton St., Philadelphia, Pa.

Sellers

SPEED-UP TOOLS

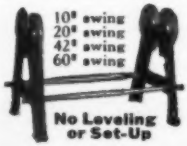
IDEAL LIVE CENTERS

NEW



Save Hours On Centering Work in Lathes, Grinders, Millers, etc.

- Three interchangeable Male and Female inserts fit all work.
- Work with heavier loads at higher speeds.
- Make Work Easy—Increase Production!



IDEAL BALANCING WAYS

- Simplify balancing crankshafts, pulleys, flywheels, etc.
- No centers required.

NEW

IDEAL "UNIVERSAL" METAL ETCHER

Marks Parts, Tools, Permanently

Prevent loss and confusion by permanently marking identification on all smooth-surfaced tools, dies, metal parts and products with the **Ideal** Metal Etcher. Engraves metal quickly, permanently. Has four etching heats. Streamlined, everything enclosed. Other models for very fine or heavy duty etching.

IDEAL ELECTRIC MARKER

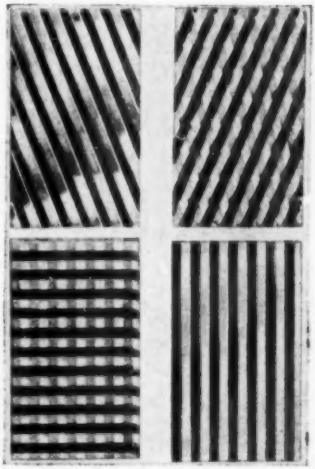
An inexpensive, lightweight tool that quickly and permanently marks practically any surface: steel, glass, ceramics, etc.

Prompt Shipment

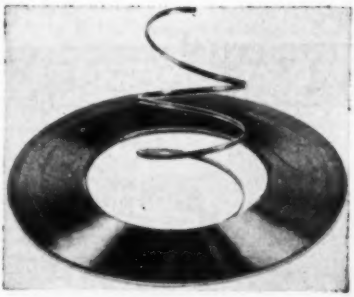
IDEAL COMMUTATOR DRESSER CO.
1441 PARK AVE., SYCAMORE, ILLINOIS
"Sales Offices In All Principal Cities"
In Canada: Irving Smith, Ltd., Montreal, Quebec

American Nickeloid Develops New Items

Several interesting, new crimped designs in American Bonded Pre-Finished Metals are announced by American Nickeloid Co.



One of these, termed a "7/16" crimp," is available in horizontal, diagonal, square, and diamond patterns in a variety of metal thicknesses. Sheet size available in most patterns up to 24x36".



SpeedWay

1/2" DRILL $24.50

This full capacity, industrial ½" Drill is handier, more powerful and an all-around better drill than many costing a third more. Specially wound high torque, forced-air cooled motor. Improved "natural grip" end and breastplate handle applies thrust directly behind drill point—and all quality features—oilless bearings, streamlined die cast case, etc., etc.

SPEEDWAY MFG. CO. 1868 S. 52nd Ave., Cicero, Ill.

Stop Drowning

Dry Clean Air

Wet Dirty Air **Drain**

Dollars!

Tolerating water in your compressed air lines is like throwing money in the lake. The Aridifier completely removes moisture, oil and dirt from air lines. It cuts air tool maintenance costs to the bone. It employs no baffles—just four propeller-like ball bearing rotors remove all contamination by centrifugal force. Removed moisture and dirt is discharged into a trap for periodical disposal.

Thousands in use.

Free trial offer!

LOGAN ENGINEERING CO., 4916 Lawrance Ave., CHICAGO

The ARIDIFIER

Dries and Cleans Compressed Air

A versatile, low priced machine—ideal for relieving or replacing heavier, higher priced machines. Equipped with Dial Indicators and Measuring Rods (illustrated at left), the Vernon is invaluable for all types of smaller jig boring operations.
PROMPT DELIVERIES
Write for folder giving complete Specifications and Prices
MACHINERY MANUFACTURING CO
1913 E. 51 ST. VERNON LOS ANGELES CALIF.
The Vernon Line of HORIZONTAL MILLING MACHINES, VERTICAL MILLING MACHINES & JIG BORERS, and 11" SHAPERS

BREAK BOTTLENECKS

In National Defense Production with QUADRUPLEX lathe apron stops and tailstock turrets. Their low cost, universal adaptability, and ease of attachment, make QUADRUPLEX an ideal multiple production combination. Send for prices today, and save time, and tooling cost.

Dept. B 1 SPECIALTIES MANUFACTURING COMPANY INC.
35 FARRAND STREET, BLOOMFIELD, N. J.

The second design, termed an "oval crimp," is introduced in two widths—⅛" and 3/16" in long, continuous coils, and in gauges ranging from .010" to .015".

Both crimps are offered in bright or satin finishes of nickel, brass, chromium, or copper electro-bonded to basic metals of steel, zinc, or brass.

The rounded contour of the oval crimp makes it very adaptable for inlay purposes, and it is finding a ready market in this field. The 7/16" crimp is being offered for a variety of purposes including reflectors, stove pads, electrical appliances, display stands, signs, and any application that requires a new decorative treatment.

Samples of the two new patterns will gladly be supplied to interested users.

"Proof of Results" Series

An unusual series of bulletins is published by the ILG Electric Ventilating Co., 2850 N. Crawford Ave., Chicago, Ill. Known as the "Proof of Results" series, these broadsides give information on specific applications of ILG products in industry.

Simplex Boring Machines

An attractive brochure on Simplex Precision Boring Machines is announced by the Stokerunit Corp., 4549 West Mitchell St., Milwaukee, Wis.

These machines are designed for precision boring on a small or medium production basis. A wide range of eleven models is offered. Stokerunit also offer a handsome booklet on their unit type precision boring machines. They consist of a series of sizes of standardized combinations of spindles, tables, hydraulic feeding systems, and electrical control which may be applied singly or in any multiple to bed units constructed to suit production requirements.

"Revolvo" Storage Equipment

Wellston offer steel cabinets of a revolving type for use in stock rooms, retail stores, and other places where a wide variety of small pieces is displayed, sold, or stored. It is pointed out that the revolving design makes it possible to store a large number of nuts, bolts, or other small parts and have them readily accessible

OPEN THE WAY TO GREATER PROFITS

BY USING S&S HINGES

BUTTS AND CONTINUOUS LENGTHS — *for* GUARDS — CAPINETS — CASES — BOXES — LUGGAGE

WRITE FOR CIRCULAR

S & S MACHINE WORKS

HARDWARE DIVISION

4539 WEST LAKE STREET CHICAGO, ILLINOIS

"Chicago" Soft Rubber Polishing Wheels

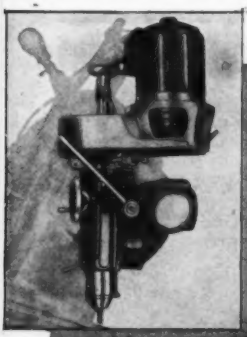
Outstanding advantages are claimed by the manufacturers of a new type improved soft rubber polishing wheel. Highly polished surfaces can be created on any base metal rapidly with this new product. Five different types of polishing compounds are impregnated in a special rubber binder. In addition there is sufficient cutting grit to remove scratches and grinding marks from the piece being polished. On many operations the use of set-up wheels can be entirely eliminated.

It is asserted that hours of hand drudgery in the finishing of tools, dies, jigs and fixtures with portable equipment can be saved by the use of these Soft Rubber Polishing Wheels. Most popular sizes and shapes of mounted wheels are available in this new and improved material. Manufacturers producing dies and tools for the National Defense Program will find time saving advantages in the use of this new product.

No special equipment is required in using these soft rubber polishing wheels. They are available in a complete range of sizes including sticks and sheet form for hand lapping. Conventional dressing tools are used to dress the faces of wheels to any desired contour so that irregularly shaped castings may be polished with ease. Any coolant which is not a solvent of rubber can be used where it would be desirable.

It is claimed that the special bond developed by the manufacturer requires less pressure in getting the desired finish. Due to the wide variety of combinations which can be incorporated in any one wheel, they present possibilities in eliminating often as many as three graduations of set-up wheels. The material is not suitable for polishing plated work.

Detailed information can be obtained by addressing inquiries to the manufacturer, Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.



EKLIND UNIVERSAL MILLING HEAD
AND TURCHAN
HYDRAULIC DUPLICATING UNIT

Model A HC Eklind Turchan Duplicating Attachment is designed and priced for die shops making Bakelite, Plastics, Rubber and Drop Forge molds and dies. Will handle average work efficiently, economically and speedily. Oil pressure controlled by tracer, feeds spindle and tracing arm to follow model accurately. Die capacity is 16" long by width depending on cross feed of machine. Capacity can be increased by mounting head on side of overarm.

Model A H Eklind Universal high speed Milling, Drilling and Boring unit is a most valuable tool room aid. Can be had separately and the duplicating attachment added later.

Send for our bulletins giving full details and prices.

UNIVERSAL HIGH SPEED TOOL CO.
551 W. Washington Blvd., Chicago, Ill.

Revised Commercial Standards For Gage Blanks

A revised standard for gage blanks has just been released by the National Bureau of Standards, Department of Commerce, under the title, "Gage Blanks (Third Edition), Commercial Standard CS8-41." This has been accepted by producers and users on the recommendation of the American Gage Design Committee and with approval of the Standing Committee.

The revision recognizes the progress in gaging practice since 1933 by the incorporation of new standards for thread setting plug gages, taper thread ring gages, dial indicators, and master disks. Standard designs without complete dimensional specifications are proposed for spline plug and ring gages, taper plug and ring gages, flush-pin gages, built-up snap gages, and flat plug gages. Adjustable length gages are completely revised, and minor changes are incorporated in the standards for trilock handles, plain and thread ring gages in the smallest ranges, taper plug and ring gages for checking taper lock handles and gaging members, plain adjustable snap gages, and twin ring gage blanks.

In promulgating this standard, it is not the intention to render obsolete existing stocks of gages in the hands of manufacturers or users; rather, the purpose is to provide a standard which can be gradually adopted in the replacement of existing stocks. Representing the best ideas of the industry at large, including gage makers and gage users, the standard should have wholehearted support of gage purchasers, and should render obsolete the wasteful and costly practice of requisitioning gages in individual designs which has existed in many cases heretofore. It is expected that tool supervisors and standards' departments of large industrial concerns will follow, as soon as practicable, the American Gage Design Standards a as substitute for any individual standards now employed.

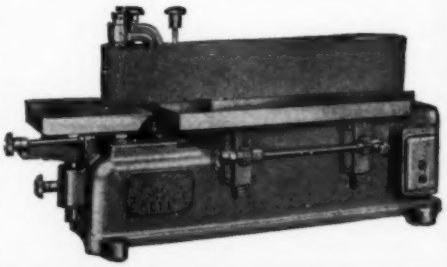
Speed Production And Lower Costs

Polish it on an E. C. No. 111!

More than ever before you need a speedy, portable polishing machine, one that will save you hours of set-up time on countless jobs.

You'll find the E. C. No. 111 will take over a large portion of the task of facing or leveling, cleaning and polishing, removing burrs, etc. Once tried, forever after indispensable.

Write for our Bulletin No. 111

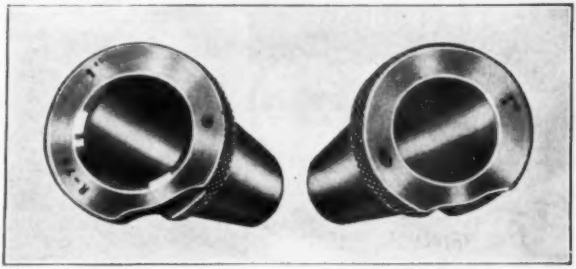


EKSTROM-CARLSON & CO.

ROCKFORD, Est. 1904 ILLINOIS, U.S.A.

A DOUBLE BARREL SHOT

at bushing require-ments



The A.S.A. and Acme Standards together give the most complete range of bushing sizes available.

This means a Standard bushing for nearly every requirement, less chance of delay through ordering "specials", and therefore greater convenience and speed in the manufacture of your jigs. (See page 2 of our bushing catalog.)

ACME INDUSTRIAL COMPANY

Specialists in Flat and Cylindrical Lapping

210 N. Laflin St., Chicago, Ill., MONroe 4122

NICHOLSON CONTROL VALVES

are made in two, three and four-way types for air, oil, water, steam, gas, etc., pressures to 5000 lbs. Style E is a general purpose valve for pressures to 300 lbs. Various metal combinations to suit any medium. Style J is for air and oil only, pressures to 125 lbs. Style H is a balanced hydraulic valve for pressures to 5000 lbs. We also manufacture foot, solenoid and motor-operated valves.

Style J

Style E

Style H

Bulletins on request.

OTHER NICHOLSON PRODUCTS: Mandrels, Arbor Presses, Flexible Couplings, Steel and Stainless Steel Floats, Steam Separators, Steam Traps, Air Separators, Air Traps, Air Vents, Etc.

W. H. Nicholson & Company

117 OREGON STREET WILKES-BARRE, PA.

CUTS TOOLING TIME
SPEEDS PRODUCTION

THE UNIVERSAL VISE

Loads and unloads with amazing speed—lever locks work instantly—holds securely—releases quickly. No complicated adjustments—no costly drill fixtures needed—just an inexpensive drill bushing plate and adaptor for each job. Sturdily constructed—nothing to get out of order. Quickly pays for itself. Only $29.75 f. o. b. Chicago. *Money Back Guarantee*

Order Today MOHR LINO-SAW CO.
130 N. Union Street, Chicago

The revised standard is effective for new production from January 1, 1941, and for clearance of existing stocks on January 1, 1942. Copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 15 cents.

Grobet File Offers New Catalog

A new catalog DSB-31 shows the most complete line of small Grobet Burs or Cutters with 1/8" and 3/32" shanks. These burs can be used with all makes of small electric hand drills such as Drem, Duro, Excel, Handee, etc., and all makes of flexible shaft machines equipped with a handpiece having 1/8" or 3/32" capacity.

Grobet Burs are made of tungsten steel for greater cutting speed and durability. They can be obtained in fine cut for use on steel, and coarse cut for use on soft metals and plastic materials.

Address Grobet File Corp., 3 Park Place, New York, N. Y. for a copy.

Abart Gears

For Precision Machinery

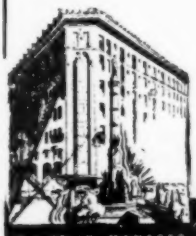
Manufacturers of precision machinery use Abart Gears because they are cut to specifications to meet precise tolerances. Their superiority is due to quality materials and long experience in gear cutting methods. No Stocks. Made to specifications only. Send us your blue prints for estimate.

ABART SPEED REDUCERS. Many types and sizes in stock for quick d-livery. Speed Reducer Catalog available. *Write.*

Abart GEAR AND MACHINE CO
MANUFACTURERS OF
Speed Reducers & Gears

Traveling Men Who Cover Buffalo

— Prefer Hotel Lafayette because — there's always a good room available — the food is excellent — the location is right in the heart of business and shopping districts.



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Single.....$2.50 up
Double.....4.00 up

Special rates for 4 or more

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E. A. STATLER MANAGER
Hotel LAFAYETTE
BUFFALO, N.Y.

NOW! The COLMONOY FURNACE WELDING PROCESS for Your Centerless Grinder Rests

This method consists of applying a casting of COLMONOY NO. 6 alloy to a steel base, by a furnace bonding process requiring no additional bonding material. One of the advantages of this process is its adaptability to high production parts, or intricate parts inaccessible for torch application.

COLMONOY NO. 6 is effecting substantial savings on machine tool parts subject to great wear and abrasion—lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, screw machine fingers, forming and drawing edges, etc.

COLMONOY may be cast or applied as an overlay, using gas or electric welding equipment.

WRITE FOR CATALOG

COLMONOY
Hard Surfacing Alloys and Overlay Metals

WALL-COLMONOY CORP.
Sixth Floor, Buhl Bldg., Detroit, Mich.
NEW YORK 558 W. 54th St. | TULSA 200 Midco Bldg. | BUFFALO 3155 Seneca St.
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CENTERLESS GRINDING

19 years' experience with all types of work and materials.

Equipped to give you production grinding to total tolerance of .0001 in.

Inquiries Solicited—
Prompt Service

ERTEL MACHINE COMPANY

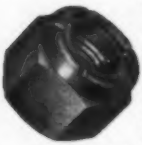
1420 East 20th St., Indianapolis, Ind.

POLISHING *HEAT TREATING*

ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
315 N. Loomis St., Chgo.
U. S. A.

WIREGRIP Belt Hooks —6 sizes of tough hooks conveniently carded. **No waste.** Makes smooth humpless flexible joint on all flat belts.
STEELGRIP Lacing — 8 sizes, applied with a hammer. For all flat belts on tough drives. Prevents end fraying.
Here at one source are all belt lacing needs, dependable satisfactory products of guaranteed material and workmanship. *Write for Catalog.*

FOR REAL PROTECTION AT VITAL FASTENINGS



IN every Elastic Stop Nut, a resilient non-metallic collar eliminates thread play automatically . . . and holds thread faces of nut and bolt in a constant pressure-contact. Cannot be loosened by vibration or hard service.

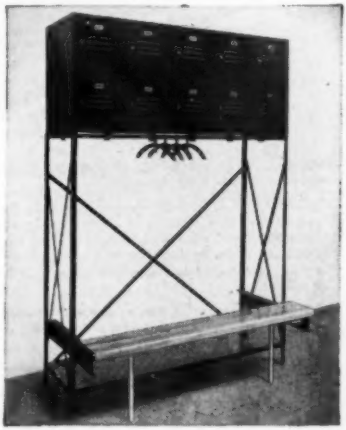
CATALOG contains a graphic explanation of the Elastic Stop principle, presents test and application data, and lists the complete line of nuts. • **Write for a copy.**

ELASTIC STOP NUT CORPORATION
2325 VAUXHALL ROAD • UNION, NEW JERSEY

Elastic Stop SELF-LOCKING NUTS

Steel Locker Unit Saves Floor Space

A group of steel constructed lockers, designated as the Penn-Kelsey Unit is shown, which is claimed to provide complete facilities for 10 persons in half the floor space ordinarily required.



Each low-cost, portable unit has an open coat space 56-½" high with the coat hangers permanently attached to the rod. There is a perforated metal shoe rack at bottom, a wooden seat, 8-½" wide and 18" above the floor, attached to the frame and 10 private, locked compartments, each of which is 12" wide, 18" deep and 12-½" high.

Doors are flanged on all sides for

STYLE A

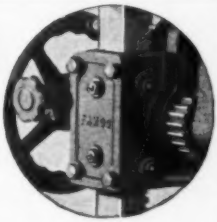
The HAMILTON PORTABLE ELEVATING TABLE—"PORTELVATOR"

No strained backs or bruised fingers if you let the Hamilton "Portelvator" do the lifting for you.
Use it as means of support—Use it to level large overhanging pieces of work—Use it as a bench to work on—An economical and efficient helper—One to twenty ton hand or power operated.

Write for full details today.

THE HAMILTON TOOL COMPANY
Ninth and Hanover Streets, HAMILTON, OHIO

FAMCO ARBOR PRESSES
ARE DIFFERENT



AN EXCLUSIVE FAMCO FEATURE
Front and side gib adjustments on all Famco Arbor Presses for perfect Ram alignment.

Hundreds of operations now being performed by hand or makeshift methods can be handled better, quicker, easier and cheaper with a FAMCO foot or arbor press. 40 styles and sizes, both floor and bench models, are built to accommodate a wide range of work.

Write for literature and prices.

FAMCO MACHINE CO.
1320 18th St., -:- RACINE, WISCONSIN

A CLAMP for Every Purpose

Forged Steel
Quick Acting
Deep Reach
Welders

Sizes Available:
¾" to 10' opening
½" to 16" deep

Write for CATALOG and PRICES on Clamps for all purposes as well as many other tools for use in the Machine Shop.

IN STOCK AT YOUR SUPPLY HOUSE

The Cincinnati Tool Co., 1945 WAVERLY AVE., CINCINNATI, OHIO

Screw Machine Cams

IMMEDIATE DELIVERY

BANNER MANUFACTURING CO.
1671 Clybourn Ave. :-: Chicago, Ill.

The HAMILTON MUEHLMATT
Super Sensitive
DRILLING MACHINES

Customers on sending in repeat orders tell us, "We want your machine—it's 'tops!'". You, too, will find it "tops" on your small hole drilling where accuracy is essential. On instrument, aircraft, diesel, and any other type of precision drilling, the Hamilton-Muehlmatt Super Sensitive Drilling Machines have a recognized superiority in precision, sensitivity, and economy.

Send for complete details.

The Hamilton Tool Co.
Ninth and Hanover Sts. Hamilton, Ohio

strength, with three ventilating louvres per door. Optional locking arrangements are a flat key lock with bevel spring-bolt or dead bolt, a spring-bolt combination lock or a padlock.

Heavy furniture steel is used in the assembly, with compartment door frame members spot welded for strength and rigidity. Nuts and bolts are cadmium plated to resist corrosion. Rubber bumper silencers are employed at contact points.

Overall size of each unit is 60" wide, 18" deep and 87" high.

Machine Tool Booklet

The May issue of "Machine Tools" is announced by the National Machine Tool Builders Ass'n, 10525 Carnegie Ave., Cleveland, O. Lavishly illustrated, this booklet depicts the vital role which machine tools are playing in defense production.

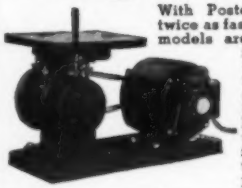
Of especial interest is a brief article titled "Today Wars Are Won in the Factory." A chart is included showing that the number of workers needed to supply a single soldier has increased from ½ in 1795 to 18 today.

Work Wanted

Let us quote you on 14" lathe work

Superior Tool Co.
P.O. Box 572 - Hamilton, Ohio

Filing Made Easier! **WRITE FOR A BULLETIN TODAY!**

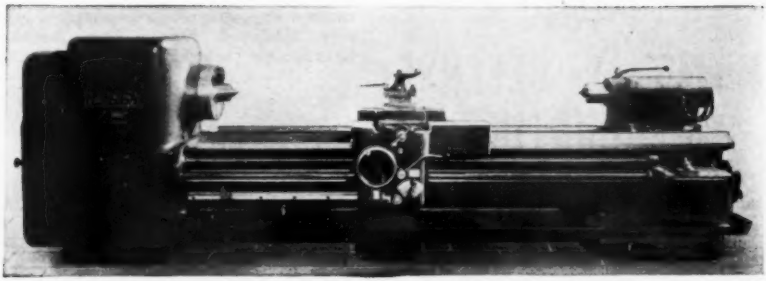


With Postel Machine filing is twice as fast as hand filing. These models are on reinforced iron frames. Ribbed 8"x8" machined cast iron table tilts on a double cradle with two bearings and positive table lock. Scotch yoke action (piston type) block is hardened and travels on a tempered pin.

The main bearing is 2½" long. Sold as low as $29.50, yet equal to filing machines selling for $49 and more. Get full information! Drop a card today! Address

Postel Filing Mch. Co.
915 Washington Ave., So. Minneapolis, Minn.

Morey 27″ Manufacturing Lathe



Built for single purpose operations—turning at the maximum speeds and feeds that Tungsten Carbide tools and other present-day tool steels will permit—a new 27″ manufacturing lathe has been developed by Morey Machinery Co.

It has been designed for efficient handling by non-skilled labor and features finger tip control. Speeds can be set up to suit each individual job and spindle feed variations are by pick-off gears. The exact feed for the job can be instantaneously selected and all feeds are hydraulic.

Other features include automatic stops — power traverse — heavy, rigid construction. Timken bearings in the headstock — all other bearings anti-friction.

Swing over ways is 28″. Maximum chuck diameter recommended is 24″. Swing over carriage slide is 11″. Distance from end of spindle nose, and tailstock center, 12′ bed, 48″. Hole through spindle, 6-¼″. Spindle-nose (Standard) taper center, Morse No. 6. Height from floor to center, 42″. Motors—for medium duty, roughing and general turning, 25 h. p.—1200 to 1800 r. p. m. For heavy duty turning, 50 h. p. at 1800 r. p. m.

Approximate weights—12′ bed, 12,800 lbs. 2′ of bed extra, 1,150 lbs.

Wrigraph
PRECISION
DRAFTING MACHINE
Brief Case Size Illustrated.
New large INDUSTRO
Drafters available — tubular arm, ball-bearing machines. Complete range of sizes up to 36"x48".
Free trial offer and catalog on request.
Write for literature and prices on Larger Models
L·G·WRIGHT, INC.

GOOD NEWS!
for DIE MAKERS

Transfer Points Eliminate Guesswork in Die Making

There's no chance for error when you use transfer screws as markers in setting dies. Points are of uniform height above hex base. Six accurately made and hardened screws nest in a special holder with hex wrench tip. Made in ¼″ to 1″ diameters.

3/16″ ..... $1.50 per set 5/16″ ..... $1.25 per set 7/16″ ..... $1.40 per set
1/4″ ..... 1.20 " " 3/8″ ..... 1.35 " " 1/2″ ..... 1.50 " "

HEIMANN MFG. CO., URBANA, OHIO

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

For

NATIONAL DEFENSE PRODUCTION

FEDERAL PRESSES are known for efficiency and quality work. Federal "Built for Service" Presses will enable you to obtain peak production at minimum cost. There's a type and size to meet your need. These presses embody all the finer qualities that will help you increase production and meet present conditions.

WRITE FOR DETAILS TODAY.

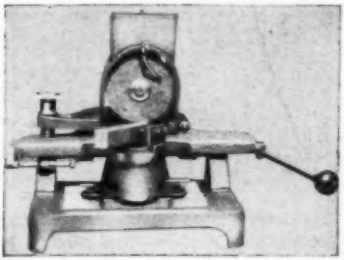
FEDERAL PRESS CO.

ELKHART, INDIANA

★ ★ ★ ★ ★ ★ ★ ★ ★

Chip Breaker Grinder

The Drafto Co., 160 Walnut St., Cochranton, Pa., announces production of a new Model A Drafto Chip Breaker Grinder for carbide metal cutting tools.



A vise of universal construction with dual locking feature, mounted on machine base, is equipped with a ball adjustment to permit setting of tool to any angle required. When correct tool adjustment is obtained, stops may be set, locking vise, but permitting tool to be removed for final inspection. Tool can then be replaced in vise and locked rigidly for grinding.

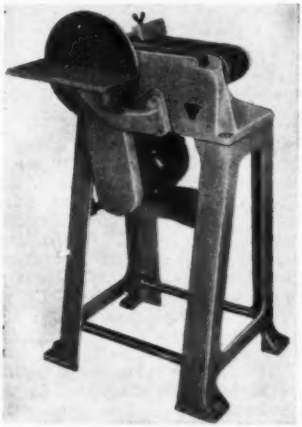
Grinding operation is performed by a diamond cutting wheel, mounted directly on motor shaft (¼ h. p., 110 volt, 60 cycle, 3450 r.p.m.). Motor is mounted directly on actuating slide, and when in operation is moved horizontally across machine. Actuating slide is anti-friction mounted. Horizontal motion of arm, shown at right, carries diamond wheel across face of tool, grooving the tip. Depth of cut is determined by turning knob on motor hinge bracket, shown at left. This knob is graduated for micrometer adjustment. A tank for kerosene is mounted directly above diamond wheel guard, and coolant is applied by means of a tube enclosing a wick to supply correct amount. Diamond wheels can be supplied in either 4 or 6" diameters—easily interchanged. Type of motor can be supplied according to customer specifications.

Abrasive Band and Disc Grinder

The new Duplex-M Grinder is supplied complete with heavy duty ½ h.p. motor, fully enclosed V-belt drive, balanced steel pulleys, dust proof ball bearings and Alemite lubricating system. Motor is mounted on table between frame legs. A simple screw device provides for belt tension adjustment.

A new handle type eccentric tension release permits belt changing, while an improved single action thumb screw provides for belt alignment. Bevel attachment is adjustable to any angle yet always close to grinding table.

The steel disc is removable—and disc grinding table is of ample proportions and adjustable. Rough grinding is done on the disc and finishing operations are performed on the abrasive band—actually two machines in one.



Abrasive band is 4"x36¼" and the disc is 12" in diameter. Speed is 1450 r.p.m. Floor space required is 20"x24" and the unit weighs 300 lbs.

Address Walls Sales Corp., 96 Warren St., New York City for further details.

Industry Swings to
CAPEWELL
See how Capewell sales are climbing! More and more concerns are discovering that Capewell precision-cutting hack saw blades cut in less time, yet wear longer. Won't these savings help you on your job? Better order a test lot from your mill supply man today.
THE CAPEWELL MFG. CO.
Hartford, Conn., U.S.A.
EACH STROKE
ALSO CUTS COSTS
CAPEWELL
HACK SAW BLADES

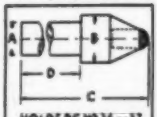
Carboloy Dressers stand abuse because they don't depend on one diamond. Instead, they have a multitude of sharp, diamond cutting points permanently held in a special matrix. To get a new cutting surface just give the dresser a quarter turn in its holder. No remountings! No worries! Lower cost! Send for catalog DR-38.

CARBOLOY COMPANY, INC.
11139 E. 8 Mile Ave.
Detroit, Michigan
Chicago, Cleveland, Los Angeles, Newark, Philadelphia, Pittsburgh, Worcester, Mass.

HOW TO ORDER

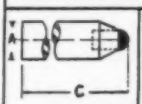
Grinding Wheel		Correct Dresser	Price Each
Diameter	Width		
Up to 20"	Up to 1½"	2-B	$ 9.60
Up to 26"	Up to 2½"	3-C	12.60
Up to 42"	Up to 8"	4-D	15.35

*Mounted Free in Desired Holder. Standard Holders shown below. Special Types when needed. Allow 1 Week—10 days for holders No 37, 38, and S-16-A.

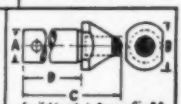


HOLDERS Nº 36 or 37

Holder	A	B	C	D
1	1/16		1 1/16	
2	1/16		1 1/16	
4	1/16		4	
5	1/16		1 1/16	
36	1/16	1/16	2 1/16	1 1/16
37	1/16	1/16	2 1/16	1 1/16
38	1/16		3 1/16	
S-16-A	1/16	1/16	1 1/16	H



HOLDERS 1,2,5,8,38

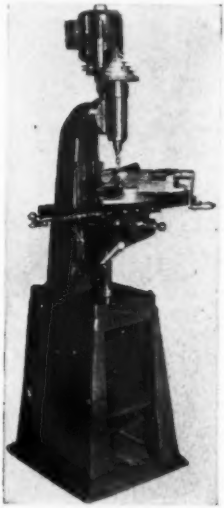


Available only in Dresser Size 2B
HOLDERS TYPE Nº S-16A

CARBOLOY Diamond Impregnated WHEEL DRESSERS

No. 1 Univertical

A sturdy new high speed end milling machine has been developed by the Univertical Machine Co. to handle the small jobs normally done on larger and more expensive machines.



Described as modern in every respect and capable of exacting precision work, this versatile unit mills, drills, and bores. It is an efficient contour miller. It is designed for the use of cutting tools up to ⅝". It can also be adapted to small grinding operations.

Spindle is smooth-running and provides a speed range of 400-3400 r. p. m.

Table dimensions are 24x4⅞" with two T slots ½" wide.

Table travel: — Longitudinal — 17"; cross travel—7"; vertical—10"; all table movements are graduated to .001".

Spindle head swings through 180 degrees with work clearance of 6½" from center of spindle to supporting column.

Motor is a heavy duty ¼ h.p. ball bearing type, 60 cycles — 1700 r.p.m. Adaptable to either 110 or 220 volts. Heavier motors easily adapted for small additional charge.

Two types are available: — a bench model—overall height 44" and a floor model—overall height 70".

Multiple Spot Welder

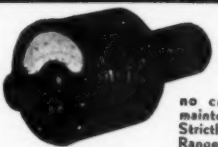
The Eisler Engineering Co. has recently developed the Multiple Spot Welder shown. The inserts, lettered from A to H, show a few of the various multiple spot welding setups possible on this machine. Adjustments can be made to make circular, straight, square, rectangular or any odd shape welds, to conform with any need. From 2 to 12 spots can be made simultaneously, depending on the nature of the job. These machines are primarily intended for the Spot Welding of light sheet metal work where a large range of adjustments for various spots and shapes are to be considered.

Pressure electrodes are used with suitable air operation equipment. The electrodes have an individual adjustment to maintain even pressure on all the spot welds being made.

Coated Abrasive Products

An attractive new 68-page brochure introduces Carborundum Abrasive Products for all purposes. Illustrations show typical uses which are described in the text. Specifications are given for the different products and considerable interesting and valuable information is included. Address The Carborundum Co., Niagara Falls, N. Y., for a copy.

PYRO RADIATION PYROMETER

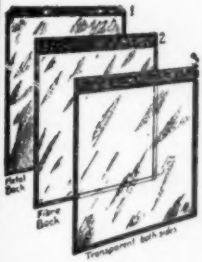


STOP spoilage. Get exact temperature of work in furnace. Direct reading; no calculations; no maintenance expense. Strictly automatic. Range 1000-3600° F.

Send for illustrated bulletin No. 100.

THE PYROMETER INSTRUMENT CO.
102-108 Lafayette St., New York

***Protect* Shop Orders, Drawings, Blueprints...**



with

WADE Shop Envelopes

Any size or style to order, stiff or flexible, to suit your requirements.

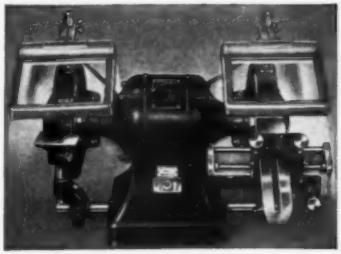
Send for folder and quotation.

WADE INSTRUMENT CO.
1422 E. 109th St., *Cedar 4728*, Cleveland, O.

Stanley Edge Tool Grinder

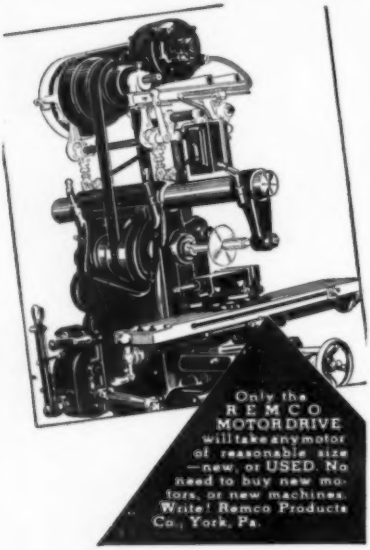
A 1/3 h. p. Grinder, ball bearing equipped throughout, with 7"x1" wheels is available with the new Stanley "Flud-Lite" Eye Shields. The Eye Shields are connected to the Grinder circuit so that lights go on or off as grinder switch is operated.

The special motor in Girnder No. 677 is said to operate at the correct slow speed so that edge tools will not have temper burned out. Two wheels are furnished with the Grinder—a special wheel for edge tool grinding and one for general grinding. Wheels are protected with guards and covers, except

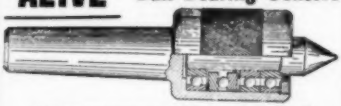


the working surface, and have exhaust outlets. A patented Plane Iron and Chisel Grinding Attachment with a micrometer screw adjustment is supplied.

The "Flud-Lite" Eye Shields have two bayonet type light bulbs which are made with a supported filament to withstand dismantling. Light from the shields is thrown directly on work and wheel.



"ALIVE" Ball Bearing Centers



"They turn with the work"

Write TODAY — and let us tell you more about them.

MODERN MACHINE CORP.
323 Berry St., Brooklyn, N. Y.

Rotary Files

These files are available in a number of different styles and sizes, in either High Carbon Steel or High Speed Steel.

Send for catalog showing a wide variety of standard shapes and special shapes. Perhaps we have what you want in stock, if not, we can grind it.

The Rotary File Co.

Hand Cut

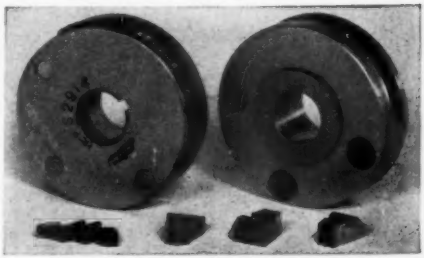
If you have need for special shape Files, we shall be glad to submit the desired File for your approval and trial upon receipt of a sample or sketch.

This service is designed especially for your convenience, for which we make no charge.

STRATFORD, CONNECTICUT

Marking Tool With Interchangeable Letters

Designed for "automatically" marking cylindrical parts in production, including shell and other ordnance units, indexed dials, rolls, etc., New Method Steel Stamps, Inc., is now manufacturing a rotary or roll-type marking device in which the letters or figures are interchangeable. The die is mounted in a holder which has a fine adjustment for starting the marking operation when brought into contact with the work. After completing the marking operation, the roll is returned to initial position by a coiled spring mounted on end of roll shaft to which die is keyed. The roll is so designed that continuous contact with the part after marking does not cause it to rotate and remark the surface. Only a single impression is made, even though the part continues to rotate before the roll is withdrawn from contact.



A special design feature is that it securely retains in position all the individual type letters or figures even when marking hard materials. Any slight movement of the type which might cause blurring or inaccurate marking is thereby eliminated. When type and spacers do not completely occupy the full opening, a movable locking device takes up the remaining open space.

Various forms of holders are available so that the device can be adapted to most applications where marking of rotating parts in production is required. Any words, letters or figures can be supplied within the circumferential range provided in the die. Marking rolls with solid dies and fixed lettering are also available for use in the same type holder as used for the die with interchangeable letters.

DOUBLE YOUR DRILL PRESS CAPACITY

Minutes are Seconds with the new TWISTITE Vise. Opens to full capacity in one second. Speed Defense Production with this New Vise.

J. A. Richards Co., Kalamazoo, Mich.

CLOSED TRADE AUTOM MARK CLOSED

OPEN Plain Type

Offset Type OPEN

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

AUTO MOULDING & MFG. CO.

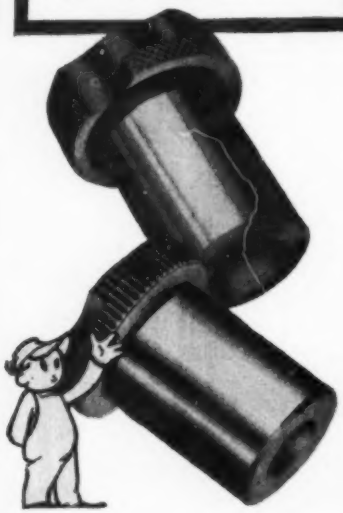
2326 S. CANAL ST
CHICAGO

SPECIFICATIONS:
Open Width 1/8" to 6"
Gage Material .040 to .125
Pin Diameter .101 to 3/8
Lengths to 120"

THREE-FOURTHS OFFSET.

SEMI-OFFSET

YOU GET MORE FOR YOUR MONEY WITH UNIVERSAL DRILL BUSHINGS...



Bores are super-finished, straight and round within .0001. Domes are black, rust proof and knurled. Lock Screws are made from nickle steel and cadmium plated. All standard sizes available. Write today for complete facts and prices.

UNIVERSAL
Engineering Company
Frankenmuth, Mich.

Infrad-Red Heat Lamps

Three new infra-red heat lamps will be placed on the market May 15 by the Birdseye Division of Wabash Appliance Corp., Brooklyn, N. Y. Two of the lamps will be clear, for use with the standard gold-plated or Alzac reflectors, but the third will not require any separate reflector since it will be built with its own reflector lining sealed inside to keep it free from oxidation and the collection of dust, dirt and fumes. The manufacturer states that the reflector lining will keep heat-reflecting value for the 6,000 hour life of the bulb because it will be made of pure solid silver which will be sealed inside the gas-filled bulb.

Differing from incandescent lamps used for lighting, the filaments of these infra-red lamps operate at lower temperatures, developing infra-red radiant energy at wave lengths which have high penetration. The unique property of these lamps and of infra-red radiant energy developed is ability to penetrate deep down into the surface films of lacquers, paints and enamels to start

A VERY POPULAR
MACHINE FOR THE
MACHINE SHOP
⅓ H. P. CAPACITY
TYPE M5A

Strand
FLEXIBLE SHAFTS

GOOD TIMES
OR
BAD TIMES
IT PAYS TO BUY
GOOD TOOLS

FLEXIBLE SHAFT MACHINES
AND
ATTACHMENTS
COVERING HUNDREDS OF OPERATIONS

WE BUILD
HORIZONTAL AND VERTICAL TYPES
FROM ⅛ TO 3 H. P.
HIGH QUALITY MACHINES
AND
FLEXIBLE SHAFTS
Since 1905

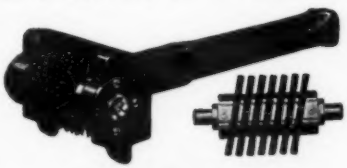
¼ H. P.
TYPE M Y 4

N. A. STRAND & CO.
5001 N. Wolcott Ave. **Chicago**

GRINDING WHEEL DRESSERS—VISES

We manufacture the only complete line of Grinding Wheel Dressers and cutters and will gladly suggest the proper one for your wheels.

The exclusive solid steel slide makes Simplex Vises stronger and more serviceable.



Desmond Heavy-Duty Dresser

Simplex Machinists' Vise

Desmond Diamo-Carbo Dresser, best tool room dresser.

Write for catalog H showing complete line of Desmond Dressers and Simplex Vises and name of your nearest dealer.

DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Canadian Desmond-Stephan Mfg. Co., Ltd.—Hamilton, Ont.

It's Easy to Telephone in this Acousti-Booth

Put your shop phone in a Burgess Acousti-Booth. You'll be *amazed* at how quiet it is inside — even in your noisiest department. There are no doors because no doors are needed. Patented sound absorbent walls soak up factory noise to give you a "zone of quiet" for easy telephoning.

There are no mechanical parts — hence no maintenance is required. Always easy to keep clean. Send coupon for full details.

Mail Coupon for Free Booklet

Burgess Battery Company, Acoustic Division
520 W. Huron St., Chicago

Please send Free booklet describing Burgess Doorless Acousti-Booth and how it makes telephoning easy in noisy places.

*Name*_____

*Firm Name*_____

*Street-City*_____

BURGESS ACOUSTI-BOOTH

Manufactured under Burgess Patents

the baking and drying process from the inside out, instantly, and uniformly.

Complete information on Birdseye heat lamps and on the subject of baking, drying and dehydrating with infrared radiant energy is contained in bulletin No. 121B.

Machinery Guarding

The importance of guards may be realized easily. Picture yourself slipping, throwing out your hand to catch yourself, and finding it resting on a guard covering some piece of moving machinery.

Think what might have happened to your hand if someone had left that guard out of place.

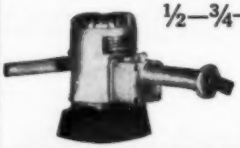
It costs money to install guards; but your company is doing this and many other things in the plant to protect you and other employees. Your cooperation will be appreciated.

1. Do not remove any guard unless for repairing, oiling or adjusting the machine; always stop the machine first; and always replace the guard when the work is done.
2. Before starting work at any machine make sure that all guards are securely in place.
3. If you notice that a guard has been carelessly left off any machine, notify your supervisor.
4. If you find that any guard is broken or furnishes inadequate protection, notify your supervisor.
5. Your suggestions for additional guards in hazardous places will receive careful consideration.

(Wood Products Safety)

CUTS GRINDING COSTS

½—¾—and MORE



HEAVY DUTY

3 Phase
60 Cycle
No Brushes

GASTON POWER TOOLS
2655 W. 95th St., Evergreen Pk. Ill.

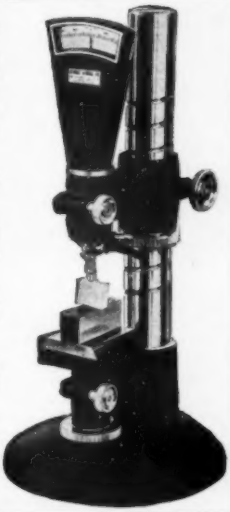
The Scherr Comparitol

MADE IN U.S.A.

with NEW, PATENTED, KNIFE-EDGE INDICATOR

The COMPARITOL is used to inspect and check mass produced parts for interchangeable manufacture, shop gauges, bearings, pins and other articles that must be kept to close limits. The scale is graduated to .0001" with a range of 002" plus and minus.

The patented mechanism consists of only two moving parts—the spindle which carries the contact feeler point and a vertical lever assembly with indicating hand mounted on knife-edge supports.



ARE YOU DOING CONTRACT WORK?

If your work does not pass your customer's inspection, it will be rejected and you may have to *do it over at your expense.*

Your mistake may hold up vital defense work. Don't take this risk. Equip yourself with the COMPARITOL, the instrument that does away with dependence on the individual's skill or measuring feel.

Make sure that your work will be accepted, that it will interchange with parts produced by other sub-contractors, by working with the COMPARITOL. Ask for bulletin.

SEND FREE INFORMATION ON THE COMPARITOL

Name .....

Address .....

City .....

State .....

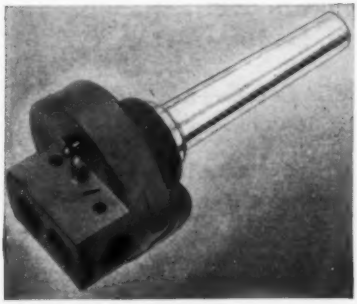
Geo. Scherr Co.

122 Lafayette St.

New York, N. Y.

Pacific Offset Boring Head

A new L & M Positive Offset Boring Head is announced by Pacific Tool & Supply Co., 344 N. Vermont Ave., Los Angeles, Cal. It is said to be very sturdy



and compact and to stand up under severe use. There are no fine micrometer screws to be strained because, instead of having a conventional dial reading which may become inaccurate and unreliable due to stress and strain on the screw, it embodies a reliable checking method in that two hardened buttons are checked with a micrometer before the required hole is cut. One button is attached to the stationary and the other to the moving or adjustable part of the boring head. One button has a flat side and the other button is completely round. By checking across these two buttons with a micrometer it is claimed that an absolutely reliable reading will be obtained.

The boring capacity of the head is 0-15". Boring bar hole size is 1". The outside diameter of the boring head is 4-7/16" and the overall length without shank is 3-11/16". Standard shanks available are B & S No. 9, 10, 11 and 12, Morse No. 4 and straight shanks for use on turret lathes.

Beverly Shear Bulletin

A bulletin on their new "B-3" Beverly Throatless Shear is offered by the Beverly Shear Co., 3005 W. 110th Place, Chicago, Ill. This new model is a heavy duty bench type shear which is claimed to cut 3/16 mild U. S. steel or 10 ga. stainless steel.

MODEL NO. 16 "SPECIAL"

Constructed as per Specifications of U. S. Naval Aircraft Factories

Reg. U. S. Pat. Off.

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

Beware of Imitations! Our machine carries the Butterfly trade mark.

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model No. L—12" Table.

HARVEY MANUFACTURING CORP.

161 Grand St., New York

Phone: CAnal 6-5170

Cullman Sprocket Catalog

Catalog No. 21 is announced by the Cullman Wheel Co., 1356 W. Altgeld St., Chicago, Ill. This booklet gives complete details on their wide line of chains and sprockets. Sprockets in stock are said to number more than 45,000. Other Cullman products listed include flexible couplings, machine tool drives, and speed reducers.

Valuable data are also included on the selection of the correct chains and sprockets and on the installation, lubrication, and care of roller chain drives.

Vernon Vertical Mill and Jig Borer Bulletin

Just off the presses, completely revised and up to date, is a new, colorful folder on the Vernon Vertical Mill and Jig Borer.

Technical details concerning the machine and the attachments available are fully covered in this 4-page 8½ x 11 brochure.

Address Machinery Manufacturing Co., Dept. HBB 441, 1915 East 51st St. Vernon, Los Angeles, Cal., for a copy.

DEARBORN Automatic Chucking and Indexing Fixture

MILLS OVER 1000 PARTS PER HOUR

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

J. W. DEARBORN

72 S. CLIFF ST. ANSONIA, CONN.

—GEARS—

Spur—Helical—Worm—Bevel—Miter, Etc.

We do broaching and all kinds of grinding.

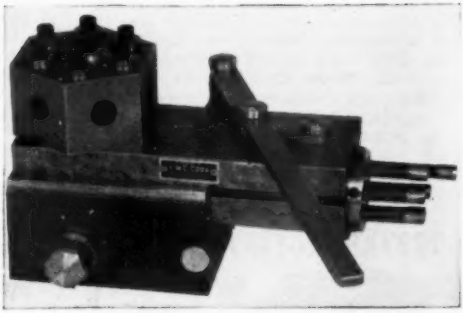
We specialize in grinding hardened steel bushings, cam rollers, etc.

Prompt service and quality has retained a large list of customers for 25 years.

TAYLOR MACHINE CO.

1919 E. 61st St., Cleveland, Ohio

Hexagon Bed Turret



Designed to step-up lathe production to a rate comparable with hand screw machines, a new Hexagon Bed Turret for Bench and Engine Lathes is announced by the C. W. C. Corporation, Hawthorn, Cal.

The Turret is said to embody several unique automatic features. Rotating as the slide is drawn back. the Turret is automatically locked in position by a tapered pin. Also automatically indexed with the Turret are the individual stops. Where it is necessary to miss the next tool or a blank side on the Turret, hand operation is suggested.

The Slide is mounted on substantial square surfaces to achieve maximum bearing and ample adjustment is provided for wear. The Turret is operated by hand lever and proper ratios of power are provided for each size machine.

Turret is designed for use with the following:— 10" South Bend, Sheldon etc.; 13" to 16" Engines Lathes, 9" South Bend Workshop lathe.

MAKE DUST GO with TORNADO

Portable Industrial Vacuum Cleaner

Cleans floors, walls, pipes, line shafting, boiler tops, — everything in mill, shop or factory. Sucks up dust, dirt, grindings, chips, etc. Cuts waste and maintenance expense, reduces fire hazards, promotes health and morale.

1 H.P. GE motor gives ample power. 12 gal. dirt capacity. Weighs only 40 lbs. Attachments for cleaning everything. Power unit easily removable for blowing dust and dirt out of motors and machinery. *Write for details and FREE TRIAL OFFER.*

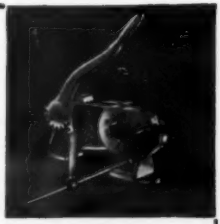
BREUER ELECTRIC MFG. CO.
5118 N. Ravenswood Ave., Chicago, Ill.

TAKE THE DUST OUT OF DUST IN with BREUER'S BALL BEARING TORNADO PORTABLE INDUSTRIAL VACUUM CLEANER

THE NEWEST in CUTTERS

★ ★ ★ ★

The "WONDER"



CUTS—Wire and rods up to 5/8 in.
CLIPS—Band iron up to 1/8 x 2 in.
MEASURES—Length of pieces.

The lowest-priced wire and band cutter on the market. Every shop, big or small can use a WONDER CUTTER.

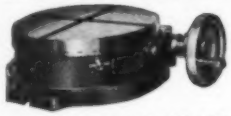
Write today for further information and prices.

The Federal Foundry Supply Co.
4602 East 71st St., Cleveland, Ohio

General Bulletin by Yoder

A bulletin is announced by the Yoder Co., Cleveland, Ohio. Although this is not a complete catalog of the Yoder line, it gives a general view of their products. Types of machines offered include roll forming machines, cut-off equipment, rotary gang slitters and side trimmers, complete tube mills, reels and coilers, and various other metal-working machines.

TROYKE ROTARY TABLES



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With or without dividing attachment.
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ALFRED A. TROYKE
4422 Appleton St., Oakley, Cincinnati, Ohio

—GRIT-CUT—
ABRASIVE CUTTER

Designed for tool rooms. Can be utilized for light production. Two convenient sizes for mounting on bench. Legs supplied at an extra cost. An inexpensive cutter costing only

$140.00

Does quick and accurate cutting at minimum cost. No job too hard for Grit-Cut.

For quick repairs the cartridge type spindle can be removed and assembled spindle substituted.

The No. 6 machine capacity is 1" solid or 1½" tubing. Size of wheel is 6". Motor is ¾ h.p., 3450 R.P.M. Spindle speed 10,000.

Let us send you complete details.

WILLIAM BOUGHTER
Whitehall Rd. near Township Line, Norristown, Pa.

Matthews Flexible Shaft Grinder

A flexible shaft grinder is offered by the Matthews Mfg. Co., Newton, Ia. The model F-2 is driven by a ½ h.p. G. E. heavy duty motor employing ball bearings. The flexible shaft features armored casing with both ends reinforced and operates a ball bearing handpiece. The three-leg base supports a convenient large steel pan for tools. The overall height of this machine is 34". Shaft extends 5' 6". A choice is offered of 1725 or 3400 r.p.m. Weight is 72 lbs.

Wayne Chemical Pocket Folder

A handy folder made of heavy paper is offered by the Wayne Chemical Products Co., 9446 Copeland Ave., Detroit, Mich. A brief history of the company is included and the folder contains a convenient pocket containing leaflets desribing their various products. Copies are available on request.

Work Wanted

A NATIONALLY KNOWN MANUFACTURER OF PRECISION MACHINERY HAS FACILITIES FOR TAKING ON ADDITIONAL WORK for: W. & S. Turret Lathes, Boring Mills, Lathes, Punch Presses, Screw Machines, Precision Cylindrical and Internal Grinding, also Sub or Full Assembly Work.

BOX 142
c/o Hitchcock Publishing Co.
508 S. Dearborn St., Chicago, Ill.

The accompanying tables, compiled by Irving B. Lueth, are for the sake of simplicity, grouped into three divisions:—heat-treatment methods, hard-surfacing materials, and wear-resistant materials. Nothing more than a qualitative analysis and listing for comparative study has been attempted, but production factors and notes on the characteristics of each type are included.

In so far as wear resistance is concerned, it is obvious that hardness of surface or material is not the only basis for selection. Factors such as toughness, unit pressures, lubrication and the presence of abrasives must also be investigated thoroughly.

HEAT TREAMENT METHODS

TYPE	HOW APPLIED	PRODUCTION FACTORS	NOTES
Induction	Locally by heating with induced currents and quenching	Local selective hardening in mass production quantities. Steels which harden successfully in medium carbon range can be induction hardened, for example SAE 1040, 1050, 3140, 4140, 4340	Usually used on crankshafts, camshafts, cams, hard case on bearing surfaces
Furnace	Steels in carbon range above 0.25 - 0.30 heat-treated in atmosphere or liquid bath furnace	Applicable to parts which can be handled in furnaces, where steel cannot be carburized and where deeper hardness is desired	0.30-0.40 carbon 12-14 chromium steel for knives, scrapers and dies is furnace hardened to obtain hardness, wear resistance, in combination with corrosion resistance of the steel
Carburized Cyanided	Packing and heating in carbonaceous materials, gas atmospheres, or liquid, depending on depth of case desired Adds carbon or nitrides to surface of steel with carbon content less than 0.25 per cent. Hardness up to 700 Brinell can be obtained	Cyaniding gives thin case rapidly, but sizes of parts are limited by bath Distortion must be considered, with higher operation temperature; greater distortion, particularly with thin sections Carburizing gives any depth of case, any hardness. Size of part controlled by size of furnace	Particularly useful for gears, cams, shafts where surface hardness plus core toughness and ductility are desired. Good for selective hardening of certain surfaces, where complete hardening is not necessary.
Nitriding	Heating special steels containing aluminum (Nitralloy) in a nitrogen atmosphere, giving thin hard case with hardness up to 1110 Brinell	Relatively slow process, carried on at relatively low temperature hence distortion not a factor	Airplane engine cylinders, injection plungers, and parts where thin hard case is desired
Surface Hardened Stainless	Now being applied to certain stainless steels, heated in special furnace with ionized ammonium gas. Hardness obtained up to 1050 surface Brinell Case depths nickel-chromes 0.001 in. chromes 0.0025 in.	Size of parts limited by furnaces now available. Acid resistance and salt water corrosion resistance of the stainless somewhat reduced. Limiting size to date 30x15 x10 in.	Particularly suitable for valve inserts, instrument parts, where corrosion resistance of stainless plus wear resistance are desired.
Ihrigizing	Heating iron or steel in presence of silicon carbide and chlorine at high temperatures. Adds silicon to surface up to 0.10 in. depth	Cannot be machined or cut by saw. Distortion must be considered. Size of part limited by size of equipment	Claimed to absorb oil in service and thus become self-lubricating. Has good resistance to corrosion at high temperature Used on cylinder liners, pump shafts
Flame-hardening	Surfaces of carbon steel (0.30-0.80) parts can be hardened locally to 400-650 Brinell with heating by oxy-acetylene flame to critical point	Good for small quantities. Rapid. Depth of hardness can be controlled from 0.06 to 0.25 in. Useful for bearing areas on large parts which cannot be handled in furnace	Alloy steels (SAE 3140, 4140, 4640) have been hardened satisfactorily depth of case being $\frac{1}{16}$ to $\frac{1}{4}$ in. Applied to tractor parts, gear teeth, latheways, etc.

Foredom Built-for-Service
FLEXIBLE SHAFT TOOLS

INDISPENSABLE in TOOL, DIE, MOLD and PATTERN SHOPS—

Yet INEXPENSIVE ENOUGH for even the SMALLEST SHOPS!

Use the **Foredom Flexible Shaft Tools** for removing burrs, corrosion and high spots, grinding, finishing, and touching up dies, cutters, tools, etc.; sharpening, identification marking, milling, slotting, cutting oil grooves, under-cutting, routing and countless other tasks.

Bench and suspension models available, some with pencil-size handpieces. Model illustrated is No. 340, priced at $39.50—with either foot or hand-operated speed control.

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27 Park Place, New York, N. Y.

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Heavy Duty
Live Centers

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Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.

Topics for Safety Meetings

Here are ten outstanding unsafe practices, determined from an analysis of hundreds of reports on the circumstances and causes of accidents. Since these unsafe practices result in thousands of accidents each year, why not use them for topics of discussion at your safety meetings?

Repairing, adjusting, oiling or otherwise working on machinery in motion which could and should be shut down.

Using defective tools, machinery, or other equipment.

Using hands instead of tools, such as attempting to remove a piece from under the ram of a press with the hand instead of with tongs.

Failure to wear protective attire, particularly goggles and safety shoes.

Lifting with bent back, and attempting to carry heavy materials or objects without additional help or without using hoisting equipment.

Standing under suspended loads, walking on vehicular right-of-way, riding on equipment intended only for handling materials.

Removing, misadjusting, or otherwise making safety devices inoperative.

Starting, using, operating, or moving equipment without authority or without giving or getting the proper signal.

Gripping materials, tools, and objects insecurely.

Running, jumping, throwing, driving, or otherwise working too fast.

(National Safety Council)

"ALNOR" PYROMETERS

for every requirement.

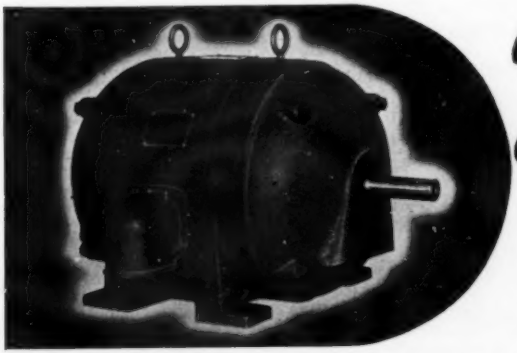
Inexpensive, accurate, durable.

Write for catalog.

Illinois Testing Laboratories, Inc.
150 W. Hubbard St., Chicago

WEAR-RESISTANT MATERIALS

MATERIAL	DESCRIPTION	PRODUCTION FACTORS	NOTES
Cast Irons	Quickly cooled castings obtain surface hardness of 400-500 Brinell depending on carbon content. Alloy additions, such as silicon up to 14 per cent add acid resistance	Can be cast into intricate shapes, which are easily machinable	Used for parts where combination of reasonable wear resistance convenience of fabrication and low cost are desired
Nickel Chromium Cast-Irons (Ni-hard)	Nickel or chromium added to chilled or sand castings increases hardness 150-250 Brinell numbers over chilled cast iron	Often heat - treated to gain additional strength and impact resistance (done with simple stress-relief treatment)	Tensile of chilled parts runs 55,000-80,000 lb. per sq. in. Particularly applicable to rolls, conveyor parts, machine tool beds and tables, etc.
Meehanite	Patented processed cast iron available in several grades:—One with abrasion resistance, another wear resistance which can be chilled, heat treated or sand-cast to achieve Brinell hardness ranging from 200-600. The nitriding grade can be hardened to 870 Brinell	Some wear - resistant grades not machinable, others are particularly so Against steel coefficient of friction is 0.17 to 0.19 Maximum hardness about same as manganese steel	Tensile varies from 38,000 to 75,000 lb. per sq. in. depending on grade Used for bushings, gears, cams, dies and sliding members
Manganese Steels (Hadfield type)	When alloy contains 10-14 per cent manganese, can be cast or forged Addition of nickel improves toughness, weldability and wear resistance	Quenched from 1800 F, gives relatively soft alloy which hardens when cold-worked, from 200-500 Brinell Manganese - nickel welding rod improves welds and may be used for hard-facing	Tensile varies from 80,000 to 140,000 lb. per sq. in. depending on composition and treatment Used for parts where severe impact and abrasion occur



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A Splash - Proof motor constructed to NEMA specifications now offered at the SAME PRICE as a standard open type motor.

A Complete line of Ball Bearing equipped Squirrel Cage Industrial Motors, built to NEMA specifications, from ½ to 75 H. P. In addition the above illustrated type RS Streamlined Splash-Proof, Semi-Enclosed motor now available at standard open motor prices. Write for data covering your requirements.

THE LIMA ELECTRIC MOTOR COMPANY

LIMA OHIO *Builders of Lima Gear Shift Drives* U S A

THE PRECISION UNIVERSAL TOOL HEAD

brings all adjustments under absolute micrometric control of the operator without stopping tool or machine. In Jig Borer, Milling Machine or Horizontal Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, under-cuts, recesses, back-faces and does an almost limitless range of "headache" jobs. Send for bulletins. Address all communications, inquiries and orders to

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MADE OF ALLOY STEEL MILLED FROM BAR

SOCKET HEAD CAP SCREWS

SAFETY HOLLOW SET SCREWS

Try Them On Your Next Job!

ECONOMY MACHINE PRODUCTS COMPANY

5207 Lawrence Ave., Chicago, Ill.

Drilling Around a Corner

It is now possible to drill holes in wood up to 1¼" in diameter at any angle to the driving spindle. This is the function of the KU 1 Kett Universal attachment for power drills. It is recommended for use with a ½" electric drill.

This light weight attachment is carefully balanced. Aluminum castings are said to possess high tensile strength. The chuck is hard-gripping and bronze bearings with sealed lubrication are used throughout.

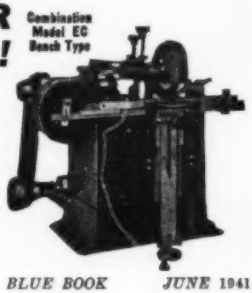
It is pointed out that this attachment should prove useful for maintenance men and others who are frequently obliged to drill holes in places which are hard to get at. A telescopic extension provides additional length when needed.

For further information address Independent Pneumatic Tool Co., 612 W. Jackson Blvd., Chicago, Ill.

Sharpens Dull Saws BETTER THAN NEW—*and saves 80%!*

Sounds incredible—but that's what the WARDWELL SAV-A-SAW is doing for other concerns. Doesn't make any difference whether you're using hack, band, or circular saws either—they're all alike to the SAV-A-SAW. Completely automatic—takes saws with teeth as fine as 32 to the inch at a 75 per min. speed. Here is ECONOMY in capital letters—savings on just 2 gross will pay back the machine cost. And you have edges BETTER THAN NEW!

Write at once for Circular EC.



THE WARDWELL MFG. CO.
3165 FULTON ROAD, CLEVELAND, OHIO

HARD FACINGS

TYPE	HOW APPLIED	PRODUCTION FACTORS	NOTES
Cobalt-Chromium-Tungsten (Stellite) Iron Alloys plus Tungsten Zirconium or Boron (Colmonoy, Stoody) Carboloy Kennametal Talide	Welded-on when furnished as rod material Brazed on after casting to shape	When welding, avoid puddling and diluting overlay and parent metal Be sure to obtain sufficient bond Relative coefficients of expansion must be taken into consideration Stress-relief after overlay application may be necessary	Hard facing materials may be applied to cast iron, alloy iron, brass, bronze, copper and other non-ferrous alloys, and to steels Less hard materials should be used on large surfaces where hair line cracks are undesirable
Tantaloy Tantalum Carbide Tungsten Carbide	Welded or brazed into place		
Metal plus Boride Crystals (Colomonoy 1)	Boride crystals sweated into parent metal		Possesses corrosion resistance as well as wear resistance
Nickel Borides (X-Aloy)	Cast-on (parent metal held in suitable mold; hard facing cast on outside)	May be ground to a high polish Will wear smooth in service Applicable to solid shafts less than 2 in. in diameter, on hollow shafts of any diameter. Solid shafts of large diameters cool slowly, hence quick-cooling overlay would be fractured by shrinkage stresses	Impervious to sulphuric, hydrochloric acids and to alkaline solutions Useful on pump plungers, shafts for centrifugal pumps, etc.
Metal Spraying (Metallizing)	Lead, zinc, brass, bronze, nickel, silver, monel, stainless, high - carbon steels can be sprayed. 0.032-0.1875 wire is fed through heating unit in portable gun. Applied at relatively low heat.	Spraying with inert gas instead of air reduces porosity Electrolysis between dissimilar metals may occur Coefficients of expansion must be considered Moisture must be avoided as it may get into pores Corrosion resistant surfaces of stainless can be sprayed over a previous spraying of lead or zinc on parent metal	Coating about 10 per cent less dense than parent metal—porosity may be advantageous in certain applications Surfaces of low-cost material can be built-up to fair wearing qualities at low cost after all fabrication processes are finished

for your lathes

SENECA FALLS Automatic WORK DRIVER

Self Centering . . . Quick Acting . . . No Slip. Attaches to any chuck plate or spindle. Provides a slip-proof, balanced drive reducing chatter. Handles rough forgings or turned pieces—straight or taper. Eliminates dogging time. Reduces tool breakage. Write for details and size range.

SENECA FALLS MACHINE CO., 314 Falls St., Seneca Falls, N. Y.

C. W. C. Polishing Lathe

Realizing the need, with stepped-up production demands, to free precision bench lathes for other uses, the C. W. C. Corporation, Hawthorn Cal., announces a new Speedy Polishing Lathe. The Lathe is designed to finish turret lathe products, remove tool marks, polish round parts and for lapping and burnishing.

A unique feature claimed for the C. W. C. Lathe as compared with ordinary Collet devices is its ability to hold, automatically, work having considerable variation in diameter without readjusting collet tension. The draw tube, being hollow, permits polishing of extremely long pieces.

BURR KEYSEATERS

Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON

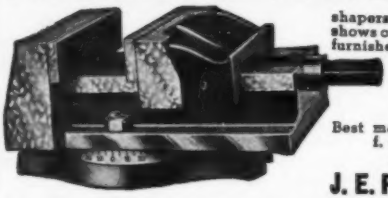
429 Kent Ave., Brooklyn, N. Y.

Hevi Duty Electric Furnaces

A new bulletin is announced by the Hevi-Duty Electric Co., Milwaukee, Wis., describing their box type electric furnaces. Twenty standard sizes are offered which include 7 standard widths. These furnaces vary from a small bench model to a large 105 kw. furnace. The maximum temperature for all models is given as 2000° F. Also available is a new bulletin on Hevi Duty Milti-Range Convection Furnaces. It is pointed out that heat transfer at low temperatures in an atmosphere not agitated is sluggish and slows down heat transfer. These furnaces are offered in 13 models designed for temperature uniformity from 400° to 1850° F.

PLUNKET IMPROVED VISES

We make a complete line of modern vises for drill presses, shapers, milling machines and grinders. Illustration shows our standard milling machine vise as regularly furnished and stocked.



In ordering this vise give size of slot in table:

No. 10—6" jaws, 1½" deep, opens 5", wt. 45 lbs., $38.00
No. 20-10" jaws, 2¼" deep, opens 8½", wt. 120 lbs., 52.00

Best material and workmanship. Prices are net f. o. b. Chicago. *Dealers' inquiries are solicited. Write for folder TODAY.*

J. E. Plunket Machine Co., 1823 W. LAKE ST., CHICAGO, ILL.

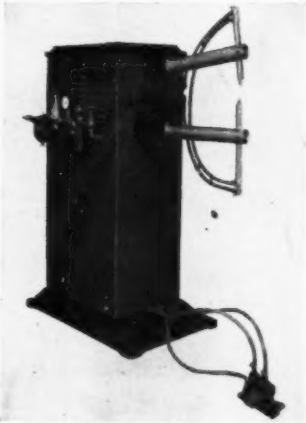
Barnes Cutter Grinder Motorized

The Barnes Precision Cutter Grinding Machine is now made motor driven as standard. This machine is designed especially for sharpening formed milling cutters such as used by manufacturers of rifles, pistols, etc. It is claimed to be highly efficient for grinding formed cutters, gangs of formed or plain cutters, etc. The makers assert that with this machine, a high degree of skill is not required in the proper grinding of irregularly formed or complicated gang cutters. Further, that no matter what the profile, the cutters may be ground accurately on these machines.

Address General Machinery Corp., 149 Federal St., Boston, Mass., for further details.

Rex Spot Welders

The Dyer Welder & Eng. Co., 7 E. 19th St., Kansas City, Mo., offers Rex spot welders. Bench models range from 2½ to 7½ k. v. a. Floor models are available in various ratings up to 100 k. v. a.



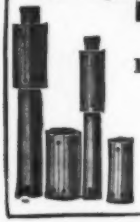
Rex heavy duty welders include press, rocker arm, and swivel lower arm types. Air, foot, and motor operated units are offered. These machines feature self-contained steel cabinets. Transformers are specially built and insulated.

LONG SPIRALLING CHIPS in place of small metal particles . . . effortless feeding instead of full strength pressure . . . life that is at least seven times that of the old type counterbore . . . these are the up-to-the-minute advantages offered by

PUTNAM HI-SPEED CONTINUOUS PILOT COUNTERBORES

PUTNAM TOOL COMPANY
2983 Charlevoix Ave., Detroit, Mich.

Champion Expanding Mandrels



½" to 6½"
Efficient—
Dependable—
Write for catalog
THE WESTERN TOOL & MFG. CO.
Springfield • Ohio

LITTELL Air-Blast Valve for Faster Safer Production

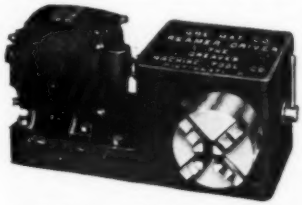
PAYS its cost in a few weeks time in —increased production—greater safety — economy of air. Automatically ejects pieces. Operator's hands are never in danger zone. Quickly adjustable air nozzle.

Automatic Roll Feeds—
dial feeds, magazine feeds, hopper feeds, for punch presses. Reels for coiled stock. *Send for Circulars.*

F. J. Littell Machine Co.
4153 RAVENSWOOD AVE., CHICAGO, ILL.

Bench Reamer Drive

The Greaves Reamer Drive is offered by the Greaves Machine Tool Co., Cincinnati, O. It is designed for bench mounting, with foot control switch on



floor. Release of foot pressure on switch stops rotation of the chuck. This frees operator's hands for holding work.

The universal chuck takes reamers up to 1½". Chuck is driven by positive worm gearing which runs in oil. This is said to assure steady rotation of the reamer, with resultant smoothness and accuracy in reaming holes.

The Greaves is powered by a ¼ h.p., 110 or 220 volt a. c. motor. Either single speed (36 r.p.m.) or two speed motors are available (30 and 60 r.p.m.).

Erickson Collet Chucks

A new bulletin is offered describing Erickson Precision Collet Chucks. A cross-sectional view is included showing all of the working parts in the chuck. It is pointed out that 3 chucks used with 15 of their 8-point grip collets will accommodate the whole range of work—from No. "80" to ½" Morse taper.

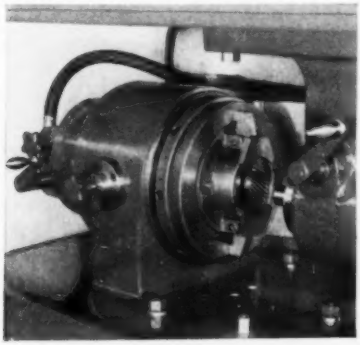
For a copy of this folder address Erickson Steel Co., 80th & Bessemer, Cleveland, Ohio.

Why Not Buy The Original Electric Etcher?
MARK IRON AND STEEL
THE ETCHOGRAPH WAY
New ELKONITE TIP pencil.
New Baby Grand Model at a lower price.
2,000 in use
BREWSTER - SQUIRES CO.
42 Church St., New York, N. Y

Internal Gear Finisher

A new type crossed axis gear shaver for finishing internal gears is announced by Michigan Tool Co.

Closely resembling, in appearance, the Michigan series 860-B rotary gear finishers for spur and helical gears, the new shaver (Model No. 860-B-I) finishes internal gears through a combination of work rotation cutter reciprocation and vertical feed for the work.

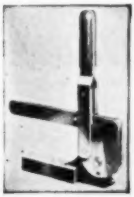


In contrast to gear finishers for external gears, the new machine provides for mounting cutter on head of machine while work is located in a special driving fixture on knee of the machine. This permits lateral reciprocation of the cutter through drive to head, while work is being rotated and fed into cutter. On other forms of Michigan rotary gear finishers, the work is reciprocated but the cutter is used for the driving member instead of the work. A close-up is shown of the work head mounted on knee of machine, with an internal gear in place. Cutter has been removed from spindle at right. This work head is driven by a V-belt from base of machine.

Special provision is made to locate the work accurately in the combination chuck and clamp prior to the shaving operation. The gear to be shaved is first slid directly forward to the approximate center of the clamp . A "gear locator" is then moved forward into gear by crank shown at left. Dimen-

3 types—36 models Toggle and Kam Klamps

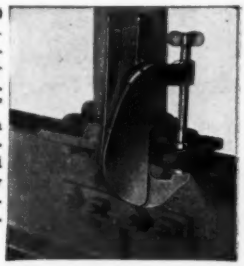
Type KV series with fixed base used extensively in the aircraft and automotive industries where a fast action, inexpensive clamp tool is required.



KNU-SINE series with hinged bases — Toggle Clamps of this type may be set at diverse angles to suit the part without further machining.

KAM-KLAMP type combines the fast action and low cost of the standard Toggle Clamp with the tremendous holding power and possible variations of a cam movement.

KLAMPACTO "C" Clamp-Toggle action—combines the advantages of the conventional "C" clamps with high speed Toggle action — designed for heavy duty structural work—5 inch throat capacity.



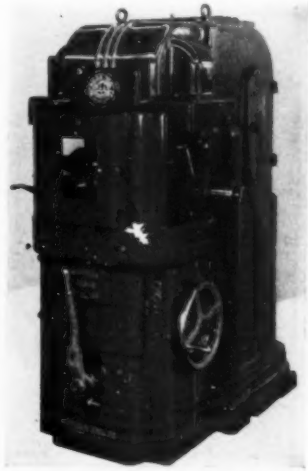
Send for catalog. Prices range from $2.20 and up —celluloid templates available at $1.00 each.

KNU-VISE, INCORPORATED

16841 Hamilton Ave., Detroit, Michigan

Los Angeles Branch 7263 Melrose

sions of teeth on the locator correspond closely with those of the gear in the semi-finished condition. With locator in the gear, the chuck ring is next revolved. When this is done, four pins move outward from face of chuck and grasp outside surface of gear, whether or not the surface is exactly concentric with the internal gear teeth. Further movement of the chuck ring draws the two clamps tightly against gear. Locator is then withdrawn into driving head. The thumb knob shown on front of driving head is finally pulled forward to release spindle, which has been held against rotation by a pin attached to this knob during the mounting procedure. Release of gear after shaving is accomplished by reversing this procedure, when gear is easily removed sidewise, since positioning pins are first withdrawn when chuck ring is loosened.



Cutter spindle at right is next brought forward into teeth of internal gear. Two crank handles are provided to control movement of spindle—one to move it into and out of the work, and the other to lock it in either position.

During the shaving operation, work is rotated while the cutter spindle reciprocates simultaneously, carrying the cutter back and forth over the gear teeth. Otherwise the cutter is free to rotate within gear. Cutter and work axis are "crossed" as in all other Michigan gear finishers.

A unique method of carrying the coolant to the work is provided. The spindle of the locator is hollow, the coolant entering it from the tube shown at the left. Six diagonally drilled holes in face of locator carry coolant directly against teeth of gear to be shaved when locator is in operating position.

DUPLEX "M"
Combination
Band and Disc Grinder

Improved and streamlined—heavily built for increased production and lower finishing costs.

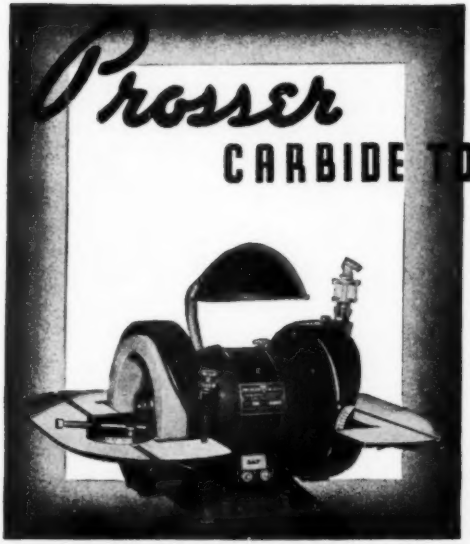
Motor Driven Ballbearing throughout—Fully enclosed adjustable drive. Large disc grinding table.

Write for illustrated folder for this and other size grinders.

WALLS SALES CORP.
96 WARREN ST. • NEW YORK, N. Y.

Prosser

CARBIDE TOOL GRINDER



Removes metal fast when rough grinding.
Finish grinds smooth, keen cutting edges.
This grinder will quickly pay for itself by increased tool performance and life between grinds.

$99.50
10 DAYS FREE TRIAL
Write for complete details

Thomas Prosser & Son
120 WALL ST. NEW YORK

OLIVER DIE MAKING MACHINES
WILL INCREASE YOUR PROFITS—

Produce those rush jobs on time—

Enable you to use less skilled labor.

Saves 50 to 60% of the labor on Dies, Gages, Cams, Stripper plates, etc., over hand methods.

PRICED AS LOW AS $125.00

SEND FOR LITERATURE

We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Tap Grinders, Point Thinners.

OLIVER INSTRUMENT CO., 1408 E. Maumee St., Adrian, Michigan

Get this Catalog

Within the covers of this 36 page catalog is an extensive range of modern protective equipment, practically designed and carefully made for wide industrial use.

A copy in your permanent file will be of invaluable assistance in solving your safety problems.

WRITE TODAY on your letterhead for a copy of catalog No. 19.

SELLSTROM MANUFACTURING CO.

646 N. Aberdeen St. Chicago, Illinois

THIS — is our New Baby! 12"x12" PACIFIC HYDRAULIC PRESS

10 ton capacity — Dimensions inside posts 8½"x8½" — Die height 8" — Movement of platen 3".

The press is otherwise similar to our larger sizes and lends itself to numerous small jobs and applications.

Write for literature and prices.

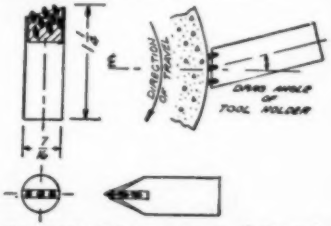
Pacific Hydraulic Press & Tool Co.

P. O. Box 67, Huntington Park Station

LOS ANGELES, CALIFORNIA

New Line of Dressing Tools

The Abrasive Dressing Tool Co., announce production of the new Redi-Edge series of diamond tools, specially designed for large-diameter form and radius dressing as required on step-wheels and bevel-edge wheels.



The Redi-Edge series is designed to combine the economy and durability of cluster tools with the sharpness and other wheel-forming advantages of fine radius dressers. In the 8R type, the eight diamonds are set in a single plane, forming a chisel edge. The tracking action of the three stones in contact with the wheel simultaneously, is said to produce a dressed finish similar to that made by a sharp, single stone.

Redi-Edge tools are manufactured with the diamonds set at the drag angle of tool holder. The tools are produced to operate efficiently on large- diameter, wide-faced wheels, with a keenness that's especially helpful for fine corners and radii, being particularly adaptable for special finishes on the wheel as the truing action is equivalent to that of a single stone.

Another type in the Redi-Edge series is the 8F type, designed specifically for straight face and straight side dressing. The positioning and type of diamonds are claimed to produce fine wheel finishes essential to certain types of grinding, as in the case of crankshaft wheels.

Giant Press for Britain

This 700,000 pound H-P-M hydraulic press, one of the first units to be completed in the new plant of The Hydraulic Press Mfg. Co. is now being put in production service in England, forming fuselage parts for bombers.

Made in 1½, 2½, 4, 6 and 8" sizes, with or without swivel base.

PALMGREN ANGLE VISES

Write for Literature

CHICAGO TOOL & ENGINEERING COMPANY

84th & Merrill Ave., Chicago, Ill.

SPEED-UP RUSH ORDERS

with these new

FAST ACTION

BEVERLY SHEARS

WRITE FOR NEW CATALOG, TODAY!

● Just the thing to speed-up those vital Defense Orders! Cuts circular, irregular, intricate and straight—FASTER, more exacting than all others! No metal distortion possible! Built to stand the gaff on industries toughest jobs! Remember you can "Shear it cleverly with a BEVERLY". Get prices now!

No. 1—cuts 14 gauge—wt. 16½ lbs.
No. 2—cuts 10 gauge—wt. 55 lbs. (Equipped with ball-bearing hold-down device)
No. 3—cuts 3/16 inch—wt. 55 lbs.

BEVERLY SHEAR COMPANY

3005 W. 110th Place, Chicago, Ill.

Non-Scratch

Drawing Compound

The munufacturer of cases for all size cartridges is an important part in the Defense Program. In drawing these cases it is necessary to have a good lubricant to keep the surface free from scratches as much as possible. A new lubricant called No. 1025 Non-Scratch has been developed for this purpose. It may be diluted with five times as much water and still be effective. Tests show it will produce from 100 to 150% more casings between stops for honing the dies.

A free working sample will be furnished to firms who are interested. Address

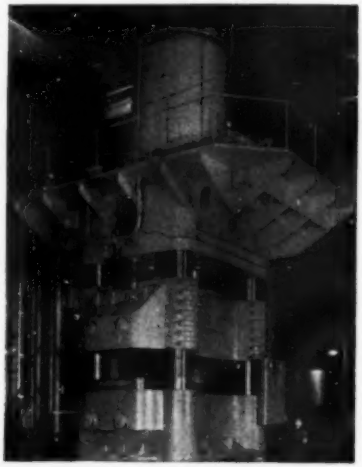
WAYNE CHEMICAL PRODUCTS CO.
9446 Copeland Ave., Detroit, Mich.

DOUGLAS
UNIVERSAL
SLOTTER 7"

With Swiveling Ram Head

DOUGLAS MACHINERY CO. INC.

It is a duplicate of a press furnished Douglas Aircraft Co., in 1937. A large rubber pad (168"x50") is recessed into the bottom of the press platen. This takes the place of upper dies. Inexpensive lower dies, mounted on the press bolster plate, are made from masonite and reinforced with steel at their cutting edges. This method of cutting and forming metal aircraft parts is known as the "Guerin Process."



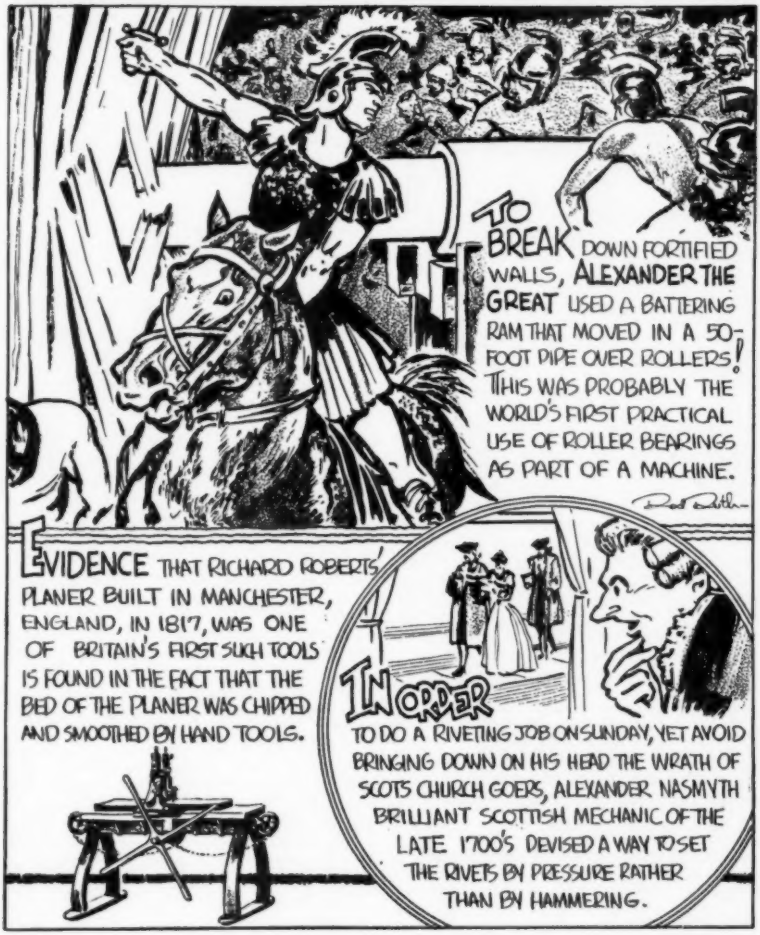
The press represents a product that is vitally required for the defense of Great Britain and the Americas. It is said to be the largest self-contained hydraulic press ever built. The cast steel cylinder weighs 170,000 lbs., the cast steel bed, 130,000 lbs. and the cast steel platen, 125,000 lbs. 2000 gallons of oil are required for operation. Two 150 h. p. motors drive four radial piston type pressure generators.

Four standard units are built for aircraft manufacturers by H. P. M.

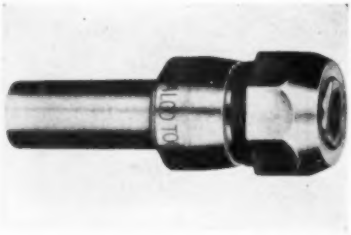
Alco Produces New Tap Holder

It is announced that Alco is already in production on a new releasing-type tap holder for hand screw machines and turret lathes.

Mechanics Through the Ages


TO BREAK DOWN FORTIFIED WALLS, ALEXANDER THE GREAT USED A BATTERING RAM THAT MOVED IN A 50-FOOT PIPE OVER ROLLERS! THIS WAS PROBABLY THE WORLD'S FIRST PRACTICAL USE OF ROLLER BEARINGS AS PART OF A MACHINE.
EVIDENCE THAT RICHARD ROBERTS' PLANER BUILT IN MANCHESTER, ENGLAND, IN 1817, WAS ONE OF BRITAIN'S FIRST SUCH TOOLS IS FOUND IN THE FACT THAT THE BED OF THE PLANER WAS CHIPPED AND SMOOTHED BY HAND TOOLS.
IN ORDER TO DO A RIVETING JOB ON SUNDAY, YET AVOID BRINGING DOWN ON HIS HEAD THE WRATH OF SCOTS CHURCH GOERS, ALEXANDER NASMYTH BRILLIANT SCOTTISH MECHANIC OF THE LATE 1700'S DEVISED A WAY TO SET THE RIVETS BY PRESSURE RATHER THAN BY HAMMERING.

Important features of the new holder are:—A rigid drive without the use of pins; no bushings are required; each tap holder will hold several sizes of taps within its capacity; one wrench is all that is needed to tighten the nut to hold taps securely; and right hand threads can be cut equally as well as left hand threads, without any adjustment in the holder.



Complete information can be obtained from The Alco Tool Co., Bridgeport, Conn.

Collapsible Tap Bulletin

The new Modern Collapsible Tap is fully described in a bulletin (No. M-111) announced by Modern Tool Works, Rochester, N. Y. It contains illustrations of this new tap arranged for stationary or rotary operation. Cross section drawings show the construction and operation and outline drawings and tables give dimensions and capacities of the various sizes in which this new tap is available.

PRESSED STEEL MELTING KETTLES

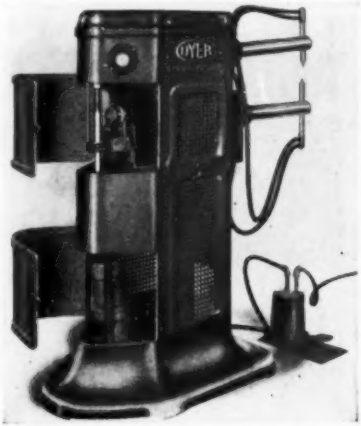
Furnished complete with pouring lip, hinged bail, and tilting hooks or pouring handle.

Send US your inquiries.

The Salem Tool Co.
SALEM OHIO

Dyer Spot Welders

The Topeka Foundry and Iron Works Co., Topeka, Kans., produces Dyer spot welders for manufacturing and machine shop use. Air operated machines are



designed for fast production work. A special timer may be used for uniform timing of the welding current. An improved bench model is also available.

Standard specifications include transformers made for 220 and 440 volts. Arms are drilled straight or offset. Electrodes are water cooled.

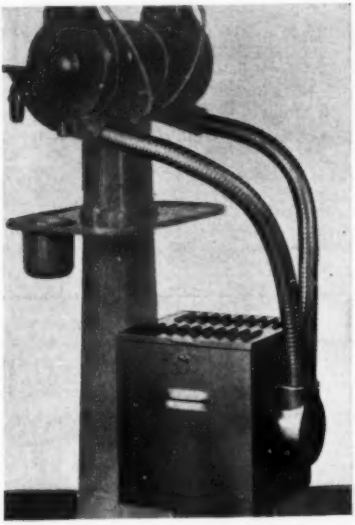
Annis Demagnetizers

Clinging particles on drills, cutting tools, punches, and dies, often contribute toward shorter tool life, short press runs between grinds, and other evils, according to the R. B. Annis Co., Indianapolis, Ind.

Annis offers demagnetizers of several types and sizes. Small and medium size pieces can usually be handled with circular or rectangular demagnetizers of their "pass-through" type. For large workpieces which cannot be moved conveniently they have a nine inch "surface type" device with handles which can be taken to the work. All of these demagnetizers operate from regular power lines and have no moving parts.

Self-Contained Dust Collector

A new low cost, unit-type dust collector having a 600 cfm rating and designed to exhaust one or more pedestal or bench grinders, cut-off machines, polishers, buffers, etc., is added to its line of dust collectors and air conditioning equipment by Aget Mfg. Co., 424 Book Bldg., Detroit, Mich. Being entirely self-contained and not requiring connecting in with a centralized collecting system, the "Dustkop 600" permits rapid installation and even subsequent moving of the machine and collector as a unit.



The new model, equipped with a ¼ h. p., 3450 r. p. m. rubber mounted 110 volt motor to provide a waterlift of approximately 3.3 inches, is sufficiently compact to be mounted on a grinder, or on the floor.

Two types of intake flanges are available to exhaust stations singly or in multiple when placed close together. When connected up with a single grinder as shown, two lengths of standard 1-⅝" flexible hose make a slip fit between the two-way intake flange and the outlet of the wheel shield. When employed to serve more than one station, an intake flange to accommodate a 5" pipe elbow is supplied.

Removal of the collected dust and dirt is by lifting the louvered cover, taking out filter assembly and lifting pan, into which the dust has fallen after being stopped by the filter.

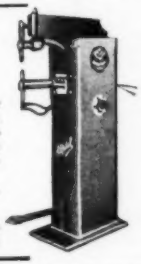
Filters of the spun glass variety, are said to stop over 99% of the dust and are quickly renewable at low cost.

ALPHIL
Spot Welders
More Production Lower Cost!

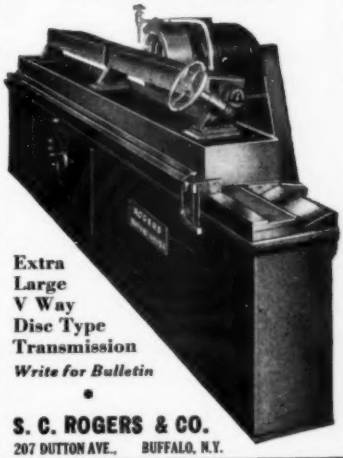
Features include: transformer which guarantees faster heat, stronger welds; water cooled electrodes and tips; automatic trip switch; adjustable arms; swivel pedal; and heat regulator.

If you have any production problems—*consult us.*

Alphil Spot Welding Co.
431 Broadway, New York, N.Y.



AMAZING PRODUCTION RESULTS FROM ROGERS NT KNIFE GRINDER



Extra Large V Way Disc Type Transmission

Write for Bulletin

S. C. ROGERS & CO.
207 DUTTON AVE., BUFFALO, N.Y.

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Available To Our Readers

If you will list below the metal-working machines or machine shop equipment in which you are interested and mail to us, we shall be glad to refer your needs to the manufacturers or companies in position to serve you. Replies will come from them—not from us.

If you have any special engineering or shop problem with which you are experiencing difficulty, suggest that you send us full details for reference to our Engineering Service Department.

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Address .....

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☐ **Interested in new equipment.**

☐ **Interested only in used equipment.**

Mail to the
HITCHCOCK PUBLISHING CO.
508 South Dearborn Street, Chicago, Ill.

Barber-Colman Bench Center

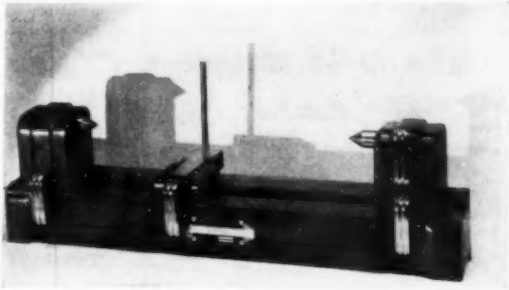
An improved Bench Center for inspecting a wide variety of small cylindrical and circular work up to 6½" diameter by 18" long, is announced by Barber-Colman Co. It offers such features as:

Quick - acting lever on tail center which, when moved to right unclamps and retracts center all in one motion.

Improved designs of ways. All three sliding members locate from the same reference surfaces, insuring accurate sliding indicator base with relative location of centers at any point along bed.

Design of ways and clamps affords free and quick sliding centers and indicator base when unclamped.

Quick acting, powerful clamps hold indicator base and centers rigidly in position.



Sturdy centers provide greater wearing surfaces in holes to preserve original accuracy.

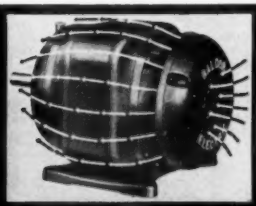
Modern streamlined appearance with nickel plated levers.

Base is cast from nickel cast iron and is of well ribbed box construction with finished ways cast integral. Both headstock and tailstock are adjustable, and may be rigidly clamped at any position

NEWEST DESIGN

Cool-running

MOTOR



Illustrating forced air-movement over entire exterior of motor frame.

BALDOR Streamcooled Design provides a totally-enclosed, ball-bearing motor with an unfailing, NON-CLOGGING cooling system.
BALDOR Glass-insulated motors withstand higher temperatures SAFELY and provide MORE H.P. in smaller frame sizes.
These and many other features at NO EXTRA COST to you.

BALDOR

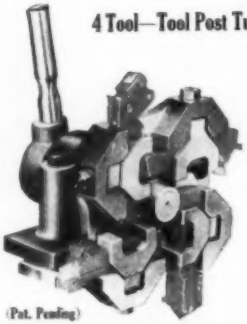
Write for Bulletin

BALDOR ELECTRIC CO.
4368 Duncan Ave., ST. LOUIS, MO.

BETTER MOTORS

Convert your engine lathe into a turret lathe in 15 seconds

4 Tool—Tool Post Turret



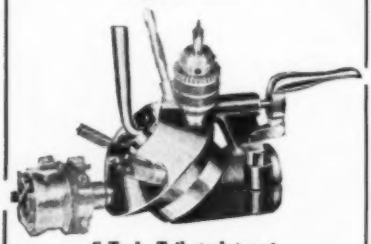
(Pat. Pending)

This **new modern tool post turret,** made in 2 sizes, has been designed to increase production on engine lathes. It is easily mounted on cross slide or compound rest. Has a capacity of 4 standard make tool holders which can be easily inserted and rigidly held.

Then there's the completely **modernized 5-tool tail-stock turret.** Made in 4 sizes. All tools are precision made attachments which will convert any engine lathe into a production turret lathe.

Jefferson precision made tools must not be confused with small and cheaply made "gadgets" now on the market.

Write for bulletin of these and other Jefferson Tools.



5 Tool—Tail-stock turret

Jefferson Machine Tool Co.
Fourth, Cutter & Sweeney Sts.
Cincinnati, Ohio

on bed by quick - acting, powerful clamps. The tail-stock has a spring-loaded, hardened and ground sliding center which can be readily locked in position. Headstock center is fixed. The slide, or indicator base, is provided with a vertical post.

Interesting Abrasive Bulletin

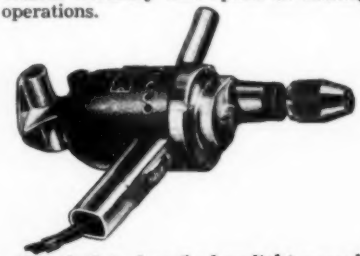
A new illustrated Bulletin showing in detail the various manufacturing processes and plant facilities used in the production of Grinding Wheels and Abrasive materials has been issued by Abrasive Co., Division of Simonds Saw & Steel Co., Philadelphia.

This has proved to be of exceptional interest to grinding wheel users and copies will be mailed on request to interested plant executives and operating officials.

It is an exceptionally attractive presentation of an industrial subject and is 11"x14" in size with 24 pages and cover.

Speedway ½" Drill

Manufacturers of the Speedway ½" Drill claim the drill's new type natural grip breastplate handle, produces a direct application of power which increases accuracy and speed of drilling operations.



The drill is described as light enough for portable use, yet heavy enough to stand up to production drilling. It has a powerful, specially wound, high torque back geared universal motor; self-aligning, oilless bearings; forced air cooling etc. It is said that the drill's low load speed makes it particularly adaptable for use with carbide drill bits in drilling brick, stone, concrete, etc. as well as regular production drilling in steel, iron, wood, etc.

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- ☐Bearings Ball
- ☐Bearings, miniature
- ☐Bearings, oilless
- ☐Bearings, roller
- ☐Bearings, thrust
- ☐Belt Fasteners, metal, leather
- ☐Belt Lacing
- ☐Belt Sanders
- ☐Belts, sanding
- ☐Bench Plates
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- ☐Bending Machines, power
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- ☐Bending Machines, Hydro
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- ☐Bushings, brass bronze

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- ☐Chucking Machines
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- ☐Furnaces, heat treat., oil or gas

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- ☐Gages
- ☐Gages, dial
- ☐Gages, plug
- ☐Gages, pressure
- ☐Gear Bores
- ☐Gear Cutting Mch.
- ☐Gear Testing Mch.
- ☐Gears
- ☐Generators
- ☐Goggles
- ☐Grinders, abrasive belt

- ☐Grinders, bench—floor
- ☐Grinders, carbide tool
- ☐Grinders, cutter & tool
- ☐Grinders, disc
- ☐Grinders, electric
- ☐Grinders, flex. shf.
- ☐Grinders, hand
- ☐Grinders, oscillat'g
- ☐Grinders, portable air
- ☐Grinders, precision
- ☐Grinders, profile
- ☐Grinders, snagging
- ☐Grinders, tap
- ☐Grinders, tool post
- ☐Grinding, centerless, (contract)
- ☐Grinding Mch., belt
- ☐Grinding Machines, universal
- ☐Grinding Wheels
- ☐Gun Making Mchs.

- ☐Hack Saw Blades
- ☐Hack Saw Machs.
- ☐Hammers, port., el.
- ☐Hammers, soft
- ☐Hobbing Machines
- ☐Hobs
- ☐Hoists
- ☐Hole Cutters
- ☐Honing Mch.
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- ☐Knurling Tools

- ☐Lapping Compounds
- ☐Lapping Machines
- ☐Lapping Plates
- ☐Lathe Dogs
- ☐Lathe Grinders
- ☐Lathe live centers
- ☐Lathes, armature
- ☐Lathes, auto.

Continued on following page

- ☐ Lathes, bench
- ☐ Lathes, engine
- ☐ Lathes, extension bed and gap
- ☐ Lathes, polishing & buffing
- ☐ Lathes, shell
- ☐ Lathes, speed
- ☐ Lathes, spinning
- ☐ Lathes, toolroom
- ☐ Lathes, turret
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- ☐ Mandrels
- ☐ Marking machines
- ☐ Meters
- ☐ Micrometers
- ☐ Milling attach.
- ☐ Milling Machines
- ☐ Milling Mch., bch.
- ☐ Milling Mch., hand
- ☐ Milling Machines, turret
- ☐ Mills, adjustable hollow
- ☐ Molybdenum
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- ☐ Vises, pipe
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- ☐ Vises, universal
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- ☐ Welders, spot
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Rogers Offers New Grinder

A new CC-33 Grinder, recently developed by S. C. Rogers & Co., 207 Dutton Ave., Buffalo, N. Y. combines flexibility with new features of design. It provides accuracy and uniformity and is of rugged construction for continuous operation. It is adaptable for a variety of work in sharpening circular or rotary knives from 2" to 20" in diameter.

A new feature is the adjustable grinding head. This is originally mounted vertically on a heavy slide properly gibbed to take up wear and is vertically adjustable 3" —that is, 1½" above and 1½" below center of work

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Hard-Edge "Red End" Hand Hack Saws come out straight from the toughest twist . . . cut fast and smooth for many more hours. Tooth-edge alone is hardened. Buy Hard-Edge High-Speed Steel Blades made by Simonds Saw and Steel Co., Fitchburg, Mass.
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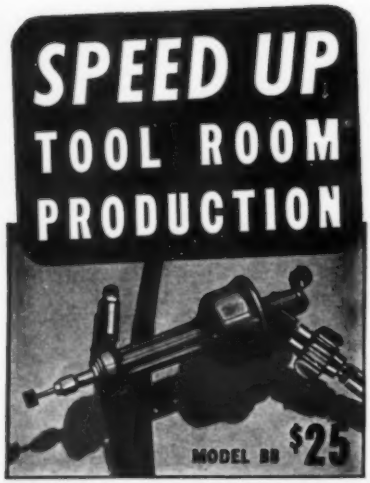

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THAT CUT COSTS - SAVE TIME

This FREE trial offer permits any concern with a satisfactory credit rating to try out any Kipp Air Tool for ten days. Grinders sell from $9.75 to $58.75. Chippers and Filers at $19.75. The BB Grinder illustrated is only $25. Kipp Air Tools give you highest speeds, lowest prices and are proving indispensable in tool rooms and production departments. New catalog gives details.

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MADISON-KIPP CORPORATION
207 WAUBESA ST. MADISON, WIS. U.S.A.

spindle. A heavy work spindle is provided which permits use of cup or straight grinding wheels up to 6x2". An additional feature is an attachment for mounting work between centers. This adds to the facility of the grinder and extends its applications.

Adjustments to meet all requirements for circular knife grinding are provided by 3 slides with hand wheel screw controls. Each slide is carefully fitted with adjustable steel gibs to take up wear. Swivel is graduated to insure correct grinding angle. The same angle is maintained without any change from wear of grinding wheel or change in size of knives.

The complete shipping weight is about 1000 pounds.

Thor Pneumatic Catalog

A new catalog describing the complete line of Thor Mining and Contractors' Air-Powered Tools has just been issued by the Independent Pneumatic Tool Company, 612 W. Jackson Blvd., Chicago, Ill. An outstanding book of its kind, it contains complete descriptions and specifications of all Thor rock drills, paving breakers, clay and trench diggers, sump pumps, saws and associated air tools. In addition, it graphically depicts specific applications and uses for all the various tools.

Profusely illustrated and attractively printed in two colors, the new catalog also gives detailed information on accessories. Copies are available on request; ask for Catalog No. 42.

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No guesswork—bearing failures—waste—idle machine time—oil-soaked motor windings—fire and accident hazards, when you modernize with TRICO OILERS. There's a type for every application.

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Classified Section

USED AND REBUILT MACHINERY

Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $5.00 for your name and address and a five line advertisement. For additional lines, 40c per line.

Write directly to those offering the machine for sale, **for prices and full descriptions. If what you seek is not advertised, write Hitchcock Publishing Company, Chicago, making known your wants on either new or used machinery and the publisher will gladly pass them along to the advertisers.**

FOR SALE BY

Aaron Machinery Co.,
176 Lafayette St., New York, N. Y.

Borer, Rockford 3" horizontal.
Die sinker, Jackson No. 4, s.p.d.
Drills, radial, 3' Morris, 3½', 4' Mueller, m.d.
Eyeletting machines, United Shoe, Model B.
Gear hobbers, G. & E. and Shuchardt & Schutte, b.c.
Grinders Brown & Sharpe No. 1, 2 universal.
Grinders, No. 55, 60, 65, Heald internal.
Lathe, Hendey 24x8', 9 speed, geared head.
Lathe, Pond 19x21'.
Lathe, 16-36"x7'-10' Fay Scott, sliding bed gap.
21" Gisholt, 3½" hollow spindle.
Bardons & Oliver No. 2, 4.
Steinle 24", Universal, 6½". h.s., m.d.
Pratt & Whitney 24x26" grd. head, s.p.d.
Miller, Cincinnati No. 4 plain.
Miller, Cleveland No. 1 plain, s.p.d.
Millers, B. & S., Cincinnati No. 2, 3.
Millers, Brown & Sharpe No. 12 production.
Miller, Cincinnati No. 3 Universal.
National-Acmes No. 53, 55, 56, m.d.
Gridley, Model F, 4 spindle, ⅜".
Gridley, single spindle, 3½"
Screw machines, automatic B.&S. No. 00, OG.
Shaper, Ohio 16", s.p.d.
36" Libby, 7⅛" hole.

Reliance Machinery Sales Company
1407 Brighton Place, N.S. Pittsburgh, Pa.

Air compressors, 139 and 450 cu. ft.
Brake, press, 6'x16 ga. Robinson.
Grinder, Bath 12x32" univ.
Hammer, 300 lb. Bradley, upright helve.
Hammers, 50 lb. Mayer upright, m. d.
Keyseater, No. 2 Baker.
Lathe, 18"x8' L. & S. geared head, s.p.d.
Lathe, 27"x15' Reed-Prentice, arr. m.d.
Miller, 30"x10' Newton planer type.
Presses, No. 1 Toledo, O.B.I.
Press, No. 21 Bliss, 2" stroke.
Press, No. 21½ Bliss, blanking, m.d.
Press, horning, No. 40 Bliss.
Press, No. 82-C Toledo dbl. crank, 5" shaft, 44" wide.
Punch, 48" throat Whiting, 1" thru 1", arch. jaw, belt or motor drive.
Roller leveller, 54", 17—4½" rolls, m. d.
Slotter, 15" Bement, crank, 36" rot. table.

What do you need? What have you for sale?

FOR SALE BY

Lloyd Machinery Inc.
150 Broadway New York, N. Y.

Boring mill, 42" Gisholt, 2 heads, m.d.
Gear generator, 11" Gleason, auto. bevel, s.p.d.
Grinder, 84" Diamond, wheel diam. 30", m.d.
Lathes, turret No. 4 Millholland 2-1/32" p.f.b.d. (2).
Lathe, turret 18" Libby Model A.
Planer, 60"x60"x10' Cincinnati, dbl. std., 3 hds., m.d.
Slotter, 24" Newton, table diam. 42", m.d.

Siegman Machinery Co., Inc.
561 W. Washington Blvd., Chicago, Ill.

Bevel gear tester, Gleason 15", m.d.
Grinder, Greenfield hydraulic, No. 1—8"x18".
Grinder, tool & cutter, Cincinnati No. 1.
Grinder, tool & cutter, Wilmarth & Morman, No. 1.
Grinder, Bryant No. OA.
Lathes, L. & S., 16x8, q.c.g.
Lathe, N. B. P. 36"x18' l. c. g. double b. g.
Lathe, 24"x12' Schumacher-Boye, l. c. g.
Lathe, turret, Acme 2" hole in spindle.
Mill, Hendey Norton No. 2 univ.
Profiler, single spindle, No. 4 Garvin.
Thread cutter, Coulter auto. 6' g. h. 4"x24" s.p.d.
Thread generator, Fellows 4"x12" capacity.

Please send us your inquiries.

Davis Machinery Company
1-3-5 St. Clair St. Toledo, Ohio

Gear cutter, 48"x12" Gould & Eberhardt, s.p.d.
Gear cutter, No. 3-36 Brown & Sharpe, s.p.d.
Gear hobber, No. 1 Farwell automatic, cone dr.
Geor generator, 5AC Lees Bradner.
Grinder, No. 14 Brown & Sharpe, b. d.
Grinder, No. 2 Diamond surface, b. d.
Grinder, No. 3 Norton tool & cutter, belt dr.
Lathe, 16"x8' Monarch, q.c.g., cone dr.
Lathe, 19"x8' LeBlond, hy. duty, q.c.g., c.p
Mill, A B Becker vertical, s. p. d.
Mill, No. 3 Cincinnati, hi power, rect. overarm, (2).
Mill, No. 2 Kempsmith plain, c.p., (2).
Mill, No. 3 LeBlond plain, c.p.
Mill, No. 4 Cincinnati plain, c.p.
Planer, 30"x30"x8' Pond, 2 heads.
Press, No. 55½ Toledo, s. s., geared.
Shaper, 20" Columbia, crank, back gd., c.p.
Shaper, 16" Cincinnati, crank, b. g. for m. d.

USED AND REBUILT MACHINERY

FOR SALE BY

Trojan Steel Company
P.O. Box 564 Charleston, W. Va.

Drill, 6′ Reed Prentice radial, b. d.
Hammer, 500 lb. Beaudry, b. d.
Hammer, 200 lb. Beaudry, b. d.
Plane, New Haven 30″x30″x9′, b. d.
Shear, splitting, Ironton, ¾ plate, 12″ blade, b. d.
Slotter, 12″ Putnam, b. d.

D. E. Dony Machinery Co.
47 Laurelton Rd., - Rochester, N. Y.

Gear hobber, No. 3 Adams.
Gear hobber, No. 1 Adams.
Lathe, 20″x10′ Davis, plain change.
Thread millers, Holden-Morgan.
Thread Millers, P. & W. 2 spindle worm.

Nelson Machinery Co., Green Bay, Wis.

Brake, Keene 10′ Cornice, No. 114.
Compressor, LeRoy Model 2S, size 315 CFM, direct m.d., 75 h.p., 3-60-220/440-860 RPM.
Drill, 28″ Barnes, sliding hd., H.W.L.&G. p.f., bd.
Planer, American 30x30x10′, belted.
Planer, Ohio 28x28x8′, belted.
Punch, Reade, 36″ throat, plain, m.d.
Shaper, 20″ Smith & Mills, b. g., belted.
Shear, Lennox circular beveling, belted.

Wm. C. Johnson & Sons Machy. Co.
1211 Hadley St., St. Louis, Mo.

Air compressors, 15 in stock.
Bolt threaders, 1″, 1½″ & 2″ Acme.
Brake, press, L&N, 10′, 10 ga.
Drill, Natco 13 spindle, No. 1 taper.
Drill, No. 2 Fox, 6 spindles.
Drills, radial, Dreses, 3′ & 4′.
Drills, radial, Fosdick, 3′.
Drills, radial, Drillmaster, new.
Grinders, 10″x30″ Landis.
Grinder, Walker 12″ rotary.
Grinder, Rivett internal.
Hammers, 300 lb. Beaudry, 75 lb. Bradley, 50 & 100 lb. Little Giant.
Lathes, 14″x6′ Monarch, q.c.g.
Lathes, 14″x6′ American, q.c.g.
Lathes, 18x10′ Sidney, q.c.g.
Lathes, 20x8′ LeBlond, q.c.g.
Lathes, 24x16′ Lodge & Shipley, q.c.g.
Lathes, 26—48x18′ McCabe 2 spindle.
Lathe, 32″x14′ Schumacher & Boye.
Lathes, 80x14 New Haven.
Lathes, 82″ Niles locomotive wheel.
Miller, No. 1½ American.
Miller, No. 3 Knight vertical.
Miller, No. 0 Steptoe.
Miller, No. 3½ Fox.
Pipe machines, 2″—4″—6″—8″—12″.
Pipe machine, 2″ Landis.
Planer, 34x32x10′ Hamilton.
Planer, 30x30x10′ Liberty.
Planer, 30x30x8′ Powell.
Press, wheel, 400 ton 84″ Niles.
Press, wheel, 200 ton 48″ Niles.
Punches, shears, bulldozers.
Roll, plate straightening, H. & J. No. 2, like new.
Rolls, 16′ Whiting, 12″ & 9½″ rolls.
Rolls, 12′ Pyramid, 14″ & 10″ rolls.
Saws, 6x6 Peerless, 12x15 Racine.
Shapers, 12″—16″—20″—24″.

Large stock guaranteed electric motors. Any size.

FOR SALE BY

J. P. Ward Foundries, Inc.
Blossburg, Pa.

Turret lathe, 30″x8″ Niles Bement Pond, 6 tool turret, 4 way tool head, cross slide, 4″ hollow spindle, quick change, 6 speed.

E. L. Klauber Machinery Co.
3221 Olive St. - - St. Louis, Mo.

Gear hobber, No. 000 Schuchardt & Schutte.
Grinder, 5″x18″ Ott plain cylindrical, b. d.
Lathe, 14″x7′ Hamilton, taper attchmt., and collets.
Lathe, 14″x8′ Fay & Scott, gap bed, draw-bar, m.d.
Milling machine, Type OV Brown & Sharpe, plain.
Press, No. 69N Bliss o.b.i., double action, roll feed.
Radial, 2½′ Carlton, high speed, belted.
Shapers, 16″-20″ Ohio, 20″ Cincinnati.
Slotter, die, Universal, 10″ rotary table, 2″ stroke.
Testing machine, Rockwell, No. 5 H-40.
Threading machines, Landis, 2″ single head.
Turret lathes, No. 3 Dreses, g.f.h., 1½″ bar feed.

S. M. Regar Machinery and Mill Supplies
Tampa, - - - - Florida

Hammer, Lingle 50 lb. power, arranged m. d.
Hammer, Little Giant 50 lb. power.
Lathes, Le Blond 17″ & 19″ rapid prod. q. c. feeds, (3).
Lathe, Bement Miles, l. c. g., 36″ factory raising blocks, 44″x22″ bed.
Lathe, Gisholt, 24″, hole in spindle 6″.
Lathes, National 18″ production, 1½, cone, (3).
Saw, cold, Higley m. d. No. 27-36″, takes blade 30″.
Slotter, Bement Miles 16″, circular table 36″.

Failor-Strafer Machinery Co.
132 Liberty St., - - New York, N. Y.

Automatic, 3½″ Gridley, single spindle.
Boring mill, 72″ Rogers, 2 heads.
Boring mill, 42″ Bullard vert., 2 hds. 3 jaw table.
Drills, 3′ American sensitive radial.
Drills, 30″ Reed Prentice, upright m.d.
Gas furnace, 2 compartment, 16″x14″.
Grinder, No. 2 Brown & Sharpe, surface grinder.
Grinder, Oliver 4 wheel wood tool grinder.
Keyseater No. 1 Davis.
Lathe, 42″x24′ Davis, m.d.
Lathe, 32″x14′ Davis.
Lathe, 32″x12′ Putnam, 3 step cone, d.b.g., hvy. duty.
Lathe, 32″x11′ American, triple geared, hvy. duty.
Lathe, 30″x14′ Davis, cone drive.
Lathe, 26″x10′ Bridgeford, 3 step cone, taper attach.
Lathe, 26″x10′ Walcott, 3 step cone, d. b. g., hvy. duty.
Lathe, 26″—48″x18′ McCabe, two spindle.
Lathe, 24″x26′ Greaves & Klusman, taper attach.
Lathe, 24″x14′ American 3 step cone, d.b.g., hvy. duty.
Lathe, 24″x12′ Porter, cone drive.
Lathe, 18″x8′ Lehman, 3 step cone, d.b.g., hvy. duty.
Lathe, 18″x6′ Lodge & Shipley, patent geared head.
Lathe, 16″x5′ Sidney, 3 step cone, d.b.g.
Lathe, turret, No. 2A Warner & S., bar equipment.
Lathe, turret 1″ Cap., Bixby hand screw mach., p. fd.
Miller, No. 2 Shields, high power, single pulley.
Nibbler, Gray, 3/16″ cap., 30″ throat.
Pipe machine, 8″ Wieland.
Planer, Cincinnati, 56″x42″x8′, 3 heads.
Planer, Cincinnati, 42″x36″x10′, 2 heads.
Press, No. 21 Bliss, inclinable.
Presses, 4 No. 3 Bliss Consolidated, inclinable.
Presses, No. O and O1, V & O inclinable.
Shear, H. & J., double angle, turntable.
Slotter, 15″ New Haven, 30″ table.
Variable speed drives, Reeves.

USED AND REBUILT MACHINERY

Lang Machinery Company — **28th St. & A. V. R. R.** — **Pittsburgh, Pa.**

Air compressor, 8"x8" Chicago NSB, 116 c.f., m.d.
Air compressors, Ingersoll-Rand XB-2, 600, 888, 1200 & 1500 cu. ft. 100 lb. pressure, motor drive.
Air comp. 14"x12" Ing. Rand "ER-1", 464 c. f., m. d.
Bolt cutter, 1" Landis, 1¼"-3" sgl. hd., b. d.
Bolt cutters, 1" Acme, Landis hds., 2 & 3 spdl.
Boring mill, 36" Bullard rapid prod., s. p. d.
Boring mill, 42" Bullard, 2 swivel heads, b. d.
Boring mill, 60" Niles, 2 heads, b. d.
Boring mill, 72" Colburn, 2 heads, r. p. t., m. d.
Boring mill, 8' Betts, 2 hds., grd. feeds, b. d.
Boring mill, horiz. 2½" bar N-B-P, knee type, b. d.
Boring mill, horiz. 3½" bar D & H, floor type.
Boring mill, horiz. 5" bar Barrett, b. d.
Boring mill, horiz. duplex B. & S., 5" bars, m. d.
Boring mill, horiz. 5½" bar Niles, floor type.
Brake, 8' x12 gauge D & K leaf type, s.p.d.
Bulldozers, No. 2 & No. 4 Wms. & White, m.d.
Drill, mult. 8-spindle, Fox, b. d.
Drill, mult. No. 3 Rockford 3 spdl., s.p.d.
Drill pointer, Sellers, m. d.
Drill, radial, 3½' Prentice, t. a., b. d.
Drill, radial, 3' & 4' Bickford, t. a., m. d.
Drill, radial, 4' Morris, t. a., m. d.
Drill, radial, 4' Fosdick, t. a., b. d.
Drill, radial, 6' Cincinnati-Bickford, t.a., m.d.
Drills, upright, 14" to 32", buildrive & m.d.
Drills, upright, 36" Aurora and Snyder, p. f., b. d.
Dividing head, 20" diameter.
Gear cutter, spur, 30"x16", B. & E., m. d.
Gear cutter, spur, 84" Newark, m. d.
Gear planers, 24", 37" and 54" Gleason, bevel, m. d
Grinder, centerless No. 3 Cincinnati, m. d.
Grinder, disc, 18" Diamond, dbl. end.
Grinder, dbl. end, Standard Elec. 7½ H. P. 220 v. d. c.
Grinder, gear tooth, Detroit No. D-12, m. d.
Grinder, internal cylinder, No. 5 Landis, b. d.
Grinder, piston, No. 2 Van Norman, b. d.
Grinder, surface, No. 16 Blanchard, m. d.
Grinder, tool & cutter, Ingersoll inserted tooth, m.d.
Grinder, univ., No. 5 B. & S., 20"x72", b. d.
Grinder, No. 60 Heald, b. d.
Hammer, 30-lb. Bradley, upright strap.
Hammer, power, 300-lb. Bradley, upright helve.
Hammer, power, No. 4 Beaudry, b. d.
Hammer, 1500 lb. Bliss, board drop, b.d.
Hammers, steam drop, 400-lb. to 8000-lbs.
Hammers, steam forging, 800 lbs.—6000 lbs.
Keyseaters, Mitts & Merrill No. 5—3½", m. d.
Keyseater, No. 3½ Baker, 3½", m. d.
Lathe, 10"x8' Seneca Falls, p. c. g. b. d.
Lathe, 12"x6' Seneca Falls, q.c.g., b.d.
Lathe, 14"x6' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 15"x8' Sidney, q.c.g., d.b.g., b.d.
Lathe, 15"x10' Sebastian, p. c. g., s. b. g., b. d.
Lathe, 15"—24"x8' Sebastian grd. head, m. d.
Lathe, 16"x8' So. Bend, d.b.g., b.d.
Lathe, 16"x8' Pratt-Whitney, p. c. g., b. d.
Lathe, 16"x10' Bradford, grd. head, q. c. g., m. d.
Lathe, 16"x24"x8' So. Bend, gap, b.d.
Lathe, 17"x6' LeBlond, automobile, b. d.
Lathe, 17"x8' LeBlond, q.c.g., d.b.g.. b. d.
Lathe, 18"x6' American, q. c. g., d. b. g., t. a., b. d.
Lathe, 18"x6' Prentice, p. c. g., t. a., b. d.
Lathe, 18"x9' Prentice turning, d. b. g., p. c. g., b. d.
Lathe, 18"x10' Hendey, q. c. g., b. d.
Lathe, 18"x8' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 20"x8' American gd. hd., q.c.g., m.d.
Lathe, 20"x10' Hamilton g. d. head, q.c. g., s. p. d.
Lathes, 26"x11' Wickes hvy. duty comb. Eng. & Tur.
Lathe, 27"x11' LeBlond, grd. hd., q.c.g., d.b.g., m.d.
Lathe, 27"x12' Putnam, hvy. duty, q. c. g., d.b.g., b. d.
Lathe, 27"x18' Sidney, d.b.g., q.c.g., b.d.
Lathe, 32"x14' S. & B. hvy. duty, d.b.g., q.c.g., b. d.
Lathe, 32"x16' Schumacher & Boye, p.c.g., d.b.g., b.d.
Lathe, 36"x18' American, p. c. g., t. a., b. d.
Lathe, 36"x26' 6" New Haven, p. c. g., b. d.
Lathe, 36"x45' N-B-P turning, grd. head, m. d.
Lathe, 40"x16' Fifield, trip. grd., int. face plate d., b.d.
Lathe, 42"x20' Springfield trip. grd., p. c. g. b. d.
Lathe, 46"x17' 7" Pond, triple grd., p.c.g., b.d.
Lathe, 48"x22½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, 48"x26½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, 60"x20' Niles, b. g., b. d.
Lathe, gun boring, 2 bar, cap. hole 12"x40', m. d.
Lathe, turret, 16" Warner-Swasey, h.s. 1 7/16", b.d.
Lathe, turret, 18" Reed, h.s., 1¾", p. f., b. d.
Lathe, turret 18" Libby, h.s. 3½", s.p.d.
Lathe, turret, 24"x24" Jones & Lamson, h.s. 2½", s.p.d.
Lathe, turret 26" Libby, h.s. 8", s.p.d.
Leveller, 64" Bertsch 7 rolls, m. d.
Leveller, plate, 48" McKay, 17-roll, m. d.
Miller, duplex, 36"x33"x10' Ingersoll, m. d.
Miller, hand, Reed, table 7"x12", b. d.
Miller, hand, No. 3 Rockford, table, 18"x4½".
Miller, plain No. 1 B & S, tbl. 37"x 11½", b.d.
Miller, plain, No. 24 Brainard, b. d.
Miller, plain, No. 2-A Milw. tbl. 48"x12", s. p. d.
Miller, plain, No. 5-C Becker-B., tbl. 60"x16", b. d.
Miller, slab, 30"x24"x12' Ingersoll, adj. rail, m.d.
Miller, univ. No. 3 B & S, tbl. 34"x19", s. p. d.
Miller, Vert. Taylor & Fenn, tbl. 20½"x6", m. d.
Miller, vertical Niles, table 42" dia. b. d.
Vertical attach., for No. 5 grd. hd. Cincinnati miller.
Pipe machines, Landis ½" to 2", belt drive, (2).
Pipe machines, 8" Williams, 2½" to 8" motor drive.
Planer, 24"x18"x4' New Haven, 1 head, b. d.
Planer, 24"x24"x8' Lodge-Davis, 1 head, b. d.
Planer, 30"x30"x6' Gray, 1 head, b.d.
Planer, 30"x30"x8' Cincinnati., 2 heads, m.d.
Planer, 36"x36"x11' Sellers, 2 heads, rev. m.d.
Planer, 36"x36"x14' Gray, 4 heads, b.d.
Planer, 48"x48"x30' Putnam, 3 heads, m. d.
Planer, 54"x54"x20' Pond, m. d.
Planer, 56"x56"x10' Gray, 4 heads, b.d.
Press, double acting, No. 1 Bliss, roller feed.
Press, dbl. crank, 79-D, Stoll 72"x26", m. d.
Press, foot lever, No. 87 Bliss stroke 1½".
Press, hydraulic 150 ton Chambersburg, m. d.
Press, hydraulic, 100 ton, Watson-Stilman, m. d.
Press, forging, hydr. 1500 ton Farrell-Birmingham, m.d.
Press, o. b. i. No. 3 Adriance, stroke 2½".
Press, o. b. i. No. 68-C Bliss, stroke 5".
Press, perforating, No. 5 V & O, str. ¾", dbl. crk., b.d.
Press, straightening, Hunt hydraulic, 50 tons.
Press, trimming, No. 58½ Toledo, m. d.
Press, trimming, No. 76½ Bliss, m. d.
Press, wheel, 300 ton Chambersburg, m.d.
Profiler, No. E3, Keller, motor drive.
Punch, lever, No. 88 Niagara, 36" throat.
Punch & shear, comb. No. 10½ Badger, ½" thru ½".
Punch & shear, No. 3 L & A, rap. act. ¾"-1".
Punch & shear, Cleveland EF, thrts. 36", 1¾" thru 1", m. d.
Punch & shear, dbl. end. No. 00 Covington, 2"-1", m.d.
Punch & shear, No. 5 Hilles & Jones, 48" throat.
Saw, band Type JM Laidlaw, cap. 6", m. d.
Saw, band 26" Crescent, tilting tbl. 20"x24", b. d.
Saws, hack, 4"x4", 6"x6", 9"x9", 12"x12", b. d. & m. d.
Saws, 20-B Racine, cap. 6¾"x6¾", m.d., (2).
Screw machine, Pratt & Whitney, cap. 1", b. d.
Shaper, 14" Hendey friction, b. d.
Shaper, 16" Steptoe, b. g., b. d.
Shaper, 16" Cincinnati, b. d.
Shaper, 16" Gould & Eberhardt, b.d.
Shaper, 21" Smith and Mills, high duty, b.d.
Shaper, 24" American, high duty, b.d.
Shaper, 25" Steptoe, b. g., b. d.
Shear, allig. Pittsburgh, cap. 2"-2½", m. d.
Shear, allig. No. 7 United, 6" square, m. d.
Shear, alligator, No. 61 Carlin, 3" round high knife.
Shear, bar, Mesta 36"x1½", m. d.
Shear, circle, No. 05 Niagara, b. d.
Shear, flying, Edwards, capacity 10 sq. in.

(Continued on next page)

USED AND REBUILT MACHINERY

FOR SALE BY

Lang Machinery Company — **28th St. & A. V. R. R.** — **Pittsburgh, Pa.**

(from preceding page)

Shear, plate, 119"x½" Wheeling, gap, 15", m.d.
Shear, plate 10'x½" United, gap 12", m.d.
Shear, plate, 125"x3/16" Hyde Park, gap 15", m.d.
Shears, plate 156"x3/16 Hyde Park, gap 17", m. d. (2)
Shear, plate 156"x3/16" Standard, gap 15", m.d.
Shear, plate 8'x1" United, m.d.
Shear, rot. No. 10-M Marshalltown throatless, 10 ga.
Slotters, 8" Betts, table 20" dia., m. d. (2).
Slotter, 18" Bement, table 36" b. d.
Slotter, die Garvin, str. 3½", tbl. 12" dia., m.d.
Straight'ner, strip. & cut. No. 1 Schuster, 2½"x¼", m.
Straight'ner, shape, No. 3 Sutton, 2-way, cap. 2½", m
Tapper, No. 2 Garvin, ½"-1", b. d.
Tapping machine, duplex Garvin 2-X, ½"-3", b.d.
Welders, 150 amps, 200 and 300 amps, portable.

Fuchs Machinery & Supply Co.
1102-4 Farnam St., Omaha, Nebraska

Broach, No. 1 LaPoint, b.d.
Drill, 2 spdl. Henry Wright, 15" overhang, prod. table.
Drill, 3' American rad., s.p.d.
Drill, Barnes 4 spdl., 20" with individual belted m.d., each spindle, 220-3-60.
Drill, Barnes 4 spdl. 16", with tapping attach., right angle b.d., sliding heads, auto. power feeds.
Grinder, No. 17 Besley disc, b.d.
Grinder, Micro internal cylinder, m.d.
Grinder, No. 60 Heald cylinder.
Grinder, pedestal, 7½ h.p., U.S.B.B.
Hammers, 50 & 100 lb. Little Giant.
Lathe, 20x10 American, d.b.g., q.c.
Lathe, 16x8 South Bend, l.c.
Lathe, 20x10 Monarch, geared head, m.d.
Miller, No. 3 Becker plain.
Nibbler, No. 1 Campbell 3/16, pedestal, b.d.
Press, No. 54 DAG Ferracute, d.a. cam.
Roll, 3'4" diam., belt drive.
Saw, 6x6 Peerless, b.d.
Saw, 9x9 Peerless hack, m.d.
Shaper, 16" Rockford, cone drive.
Shaper, 24 B. E. Turner drive, rebuilt.
Shear, No. 2 Ryerson serpentine, m.d.
Shear, ½" Kling rotary splitting.
Slotter, 10" Putnam, 27" table.

Joseph Hyman & Sons,
Tioga and Almond Sts., Philadelphia, Pa.

WORLD'S LARGEST STOCK
POWER PRESSES

Marquette 4 point suspension press, tie rod, 8" stroke.
Bed 72" R to L x 64½ F. to B. pneumatic air cushion in bed, weight 73,000 lbs.
No. 65K Niagara, gap, grd., double crank, 72".
No. S 126 Ferracute, dbl. crank 124", crank 7½"—9".
No. 105 Consolidated gap, d.c.
No. 106 Bliss gap, double crank, geared.
Nos. 93B, 92B, 91C, Toledo double crank presses.
No. 76½ Bliss, geared, straight side.
No. 56½ Consolidated, geared.
Nos. 74½, Bliss straight side.
No. 1½ Bliss, toggle press.
No. 164½ Toledo, toggle press, tie rod.
No. 164½ Toledo toggle press.
Nos. PA3 Ferracute & 13 Toledo horning. (3)
No. 25½ Bliss-Consol. horning.
No. 662 Toledo, 250 ton knuckle joint, coining.
75 ton EG51 & E51 Ferracute.
400 ton Perkins, coining.
250 ton & 150 ton Waterbury Farrel, coining.
No. 23 Bliss, 250 ton, knuckle joint.
150 ton EG52 Ferracute, knuckle joint.
Hammer, No. 4B Nazel, m.d.
Punches & shears, single & double end.
Squaring shears, various sizes.
These and hundreds of others of popular makes and sizes, are in stock at our warehouse here.
Rebuilt and Guaranteed.

Jones Machine Tool Company
Front & Pike Sts., Cincinnati, Ohio

LATHES

16"x6' Champion, q.c.
18"x8' National, q.c.
16"x8' Lodge Ship., q.c.
18"x10' Mueller, q.c., c.d.
20"x10' Hamilton, q. c.,
22"x12' Mueller, q.c.
18"x10' Monarch, q. c.,
22"x12' Amer., q. c., c. d.
30"x16' Amer., l. c., c. d.
26"x12' Bridge'd, q.c., c.d.
32"x14' Amer., l. c., c. d.
28"x14' Boye & E., c. d.

MILLERS & SHAPERS

No. 3 LeBlond Uni. c.d.
No. 1 Kemp. pl. Miller.
No. 3-A Owen plain, c. d.
No. 7-H Becker.
No. 13 B. & S. miller.
26" Kelley b. gd. cone.
24" G. & E. cone drive.
20" Steptoe, b. g., c. d.
20" S. & M., b. g., c. d.
14" G. & E. hi. duty, c. d.
24"x6' Ohio planer, 1 hd.

MISCELLANEOUS

92 F, Toledo, b.g., dbl. c. press.
No. 4½ Bliss, plain, d. c. press.
No. SR102 Ferracute d.c., press.
No. 20C & 21 Pliss, Inc. presses.
26"-36" & 48" B & S gear cutters.
20" style F Baker drills, c. d., (6).
No. 5 Foster tur., bar fd.
6' Fosdick radial, s. p. d.
2" Acme bolt cutters.
6" Williams pipe thread.
36"x¼" Niagara shear.
8'x10 ga. power lf. brake.
12½-20 & 40 kw spot weld.
No. 1½ Cin. tool & cutter grinder.
No. 1 Le Blond tool & cutter grinder.

Foster Machinery Co.
3982 Bluestone Rd. Cleveland, O.

Buffer, 3 h.p. 3400 r.p.m., 220 volt.
Bulldozer, Williams & White No. 4, double end.
Bulldozer, Williams & White, No. 23.
Forging roll, No. O.C. Ajax.
Grinder, 10"x30" Landis (universal).
Lathe, 13x6, South Bend.
Miller, No. 2 B. & S. universal.
Punch, Long & Alstatter, 36" throat, 1¼" cap. arch jaw.
Saw, 6" Newton, cold.
Saw sharpener, 11S Cochrane & Bly.
Welder, ½" butt.

Galbreath Machinery Co.
306 Empire Bldg., Pittsburgh, Pa.

Air compressor, 676 CFM. Ing-R. XRE. 3/60/440 V.
Air compressor, 511 CFM. Chgo O-CBE, b.d.
Hammers, 100, 1500 & 2000 lb. steam, s. f.
Ladle, 110 ton Treadwell, o. h.
Punch, s.e. No. 5 H & J. 48" tht., 2"x1½", b.d.
Punch, s.e. No. 3 Whiting, 48" tht., 1x1", A.J., m.d.
Punch, s. e. No. 2 H. & J., 20" tht., 1x1", A.J., m.d.
Punch, s.e. No. 7 L. & A., 4" tht., shear blades, b.d.
Reduction gears, 250 h.p. 7.2:1., 800 h.p. 34.6:1, 1000 & 1200 h.p 29:1.
Sand blast. Pangborn, M-O., 34 hf., m.d.
Shear. S.E., No. 2 H.c.J., slitting blades, m.d.

USED AND REBUILT MACHINERY

FOR SALE BY

The Nutmeg State Machinery Corp.
1041-1051 State St., New Haven, Conn.

Boring mill, Espen Lucas No. 26, 4" bar with ex. table.
Grinders, Bryant No. 30, chucking, 35" swing, motor driven by 3 motors, (3).
Grinder, Persons Arter 8" rot. sur. with tank & pump.
Grinder, Brown & Sharpe No. 2 universal.
Grinder, Cincinnati, 12"x36" universal.
Turret lathe, Acme 3½"x36", geared head.

Standard Machinery Co.,
347 Indiana Ave. Grand Rapids, Mich.

Cylinder grinder, Heald No. 65.
Drill, 25" Superior, sliding head.
Drill, 40" New Haven, sliding head.
Extractor, DeLaval 26 quart.
Gear cutters, Whiton No. 14 automatic, (2).
Lathe, 24"x8' Lodge & Shipley, q.c.g.
Lathes, 9"x14" Porter-Cable Mfg. (2).
Lathe, 2"x24" Jones & Lamson, flat turret.
Tapper, Anderson No. 40 Dial Feed Auto.
Welder, Expert Portable, 50 KVA.
Welder, Thompson Spot 25 KW, foot operated.

FOR SALE BY

The Reeve-Fritts Company
28 N. Clinton St., Chicago

Broach, No. 3 horiz., belt drive.
Drill, radial No. 3 Barnes, horiz. duplex.
Grinder, Gisholt universal tool.
Hammer, 100 lb. Little Giant upright.
Lathe, 17"x8' Sidney, q.c.g.
Miller, No. 3 Kempsmith plain.
Polishing mach., Blevney, 6" belt.
Saw, cold, No. 15, Lee-Simplex, 54" cap.
Tapper, No. 1 Garvin vertical, 1" cap.
Turret lathe, 19" P. & W., geared head.

The State Machinery Company, Inc.
865-67 Congress Av., New Haven, Conn.

Gridleys, 4½", single spdle., m.d., d.c., variable speed, 230 volts, (2).
Gridleys, 2½", single spdle., m.d., d. c., variable speed, 230 volts, (2).
Drill, Pratt & Whitney No. 13, mult. spdle., 16 spdls.
Grinder, Greenfield Hydromatic internal, m.d., 3 ph., 60 cycle, 220 volts.
Ice machs., Reming., with 40 h.p. slip ring motrs., (2).
100 other machines.

West Penn Machinery Company

Air compressors, 30 to 2500 cubic feet.
Air compr. portable gas I-R 180 cu. ft.
Bending roll, 8'x¾" Cleveland, m. d.
Blower, No. 4 Roots, capacity 2110 c. f. m.
Bolt cutters, 1½" & 3" Acme, b. d.
Boiler, 45 h.p. Titusville 110 lb. pressure.
Boring mill, 34" Colburn, turret hd., b. d.
Brake, 8'—12 ga. D & K, hand.
Bulldozers, Nos. 2, 4, 8, 28, &30.
Crane, 4 ton Shepard, 21'5" span, 440/3/60.
Crusher, jaw, No. 4 Champion, b. d.
Die filer, No. 3 Thiel, m. d.
Die sinker, No. 2 P&W., b. d.
Drill sharpener, Ing.-Rand "Leyner", 1¼".
Drill, radial, 4' Fosdick, speed-box, s.p.d.
Drill, radial, 5' American, semi-univ., b.d.
Drill, radial 6 Reed-Prentice, single pulley drive.
Drills, upright 10" to 36".
Drill, No. 216 Baker, No. 5 M, T., b.d.
Engine, gas, 20 horse power Bessemer.
Gear cutters, 11", 18" & 24" Gleason.
Gear tester, bevel 18" Gleason.
Grinder, "Kwick-Way" all purpose, m.d.
Grinder, drill, No. 31 Oliver, ½", m. d., 220/3/60.
Grinder, internal, No. 60 Heald, b.d.
Grinder, knife 10' Bridgeport, m.d.
Grinder, roll, Farrel 30"x16"
Grinder, surface vertical, 30" table, 16" wheel, m.d.
Grinder, tool & cutter, Greenfield, b.d.
Grinders, D. E. 2—3 & 5 h. p., 220/3/60.
Hammers, 50 lb., 75 lb., 100 lb., 200 lb. Upright.
Hammers, Nos. 2-B, 3-B, 4B, 6-B, Nazel.
Hammers, steam, forging & drop.
Keyseater, No. 1 Davis, 1"x8", m.d.
Keyseater, No. 1 Baker 1½"x12", b.d.
Lathe, precision, No. 3½ Rivett, b.d.
Lathe, bench, 11"x4' South Bend, m. d.
Lathes, speed, 11" and 13" Blount, m. d.
Lathe, brass 18x6", friction head, power feed, b. d.
Lathe, 18"x12' Hendey, grd. head, t. a.
Lathe, 20"x10' Springfield, t. a., m.d.
Lathe, 20"x12' Monarch, q.c.g., d.b.g., b.d.
Lathe, 21"x8' LeBlond, q.c.g., d.b.g.
Lathe, 24"x10' Lodge & Shipley, q.c.g., d.b.g.
Lathe, 26"x18" Pittburgh, d b.g., t.a., b.d.
Lathe, 42"x16' Schumacher Boye, q. c. g., belt drive.

1210 House Building, Pittsburgh, Pa.

Lathe, Lo-Swing, 6"x60", s. p. d.
Lathe, roll, 42"x20' United, m.d.
Lathes, turret, Nos. 1, 2 and 3 W. & S., b. d.
Lathe, turret H-21" Gisholt, 3½", b.d.
Locomotive, gas, 6 ton Milwaukee, 36".
Miller, shaper, duplex, No. 14 Cochrane-Bly, m.d.
Miller, Lincoln No. 32 Kempsmith, b.d.
Miller, Lincoln, No. 5 Hendey, b.d.
Millers, plain, No. 13½ Garvin, b. d.
Miller, vertical, Burke, table, 16x6, b. d.
Miller, vertical, No. 5-C Becker, m.d.
Mixers, Sprout-Waldron, batch & liquid.
Nibbler, No. 1 Campbell 3/16", 6" gap, m. d.
Nibler, L.&A., ¾", 36" throat, m.d.
Pipe mchs., 2", 4", 6", 8" & 12" Landis-Oster-Williams.
Planer, 24"x24"x6' Gray, 1 head, b.d.
Planer, 39"x36"x12" Cincinnati, 2 hds., b.d.
Press, forging, 150 ton United, steam hyd.
Press, toggle, 525 ton Garrison, b.d.
Press, screw, No. 87 Niagara, hand power.
Press, strip feed, No. 31-C McDonald, b.d.
Pumps, centrifugal 6", 4", 1", motor drive.
Punch, EF Cleveland, 36" throat, 1¼" thru 1".
Punch, multiple, 32E W & W, 10'2".
Riveters, air, hammer, spinning.
Rolling mill, cold 9"x18" motor drive.
Saws, friction, Nos. 2, 3 & 4 Ryerson motor drive.
Saw, metal band, Laidlaw, m.d.
Shapers, 16", 20", 24" & 36" Gould & Eberhardt.
Shears, alligator, 1½", 2", 3", 4" & 6".
Shear, Angle 6x6x1 Long & Allstatter, m. d.
Shear, Niagara 42"x14 ga., belt drive.
Shear, Stoll 60"x3/16", motor drive.
Shear, 84"x1/4" H. & J. 36" gap, m.d.
Shear, plate, 96"x1/4" Morgan, 22" gap.
Shear, guill, No. 2 H. & J., 24" rd. b. d.
Shear, guill., 4'x4" Newbold, b.d.
Shear, throatless, No. 114-M Marshalltown, ¾", m.d.
Straightener, 12'x¾" Shuster, b. d.
Straightener, 12'x1" Shuster, b.d.
Straightener, 60" McKay, 17 rolls 4½", m. d.
Straightener, 84"x1" Bertch, m.d
Testing machine, 400,000 lb. Riehle, b. d.
Tumbling barrel, 34"x48", belt drive.
Upsetters, 1" to 6".
Welder, spot, 13 K. V. A.

FOR SALE BY

Bleser Mfg. & Machine Company
112 N. 12th St., - Springfield, Ill.

Crane, Whiting hand crane, 2 ton capacity.
Lathe, 19"x8' Schumacher, Boye & Emmes..... $350
Lathe, 20"x10' Bradford..... 375
Molding machine, International 26x8P—Air operated.
Shaper, 32" American..... 495

B. D. Brooks Co., Inc.
119 Broad St. Boston, Mass.

Sheet metal working machinery, hand and power.
All types of new and reconditioned equipment.
Apron brakes, press brakes, shears, folders.
Bending rolls, corrugating rolls, forming rolls.
Punches, beaders, rotary machines, stakes, etc.

T. R. Wigglesworth Machinery
5124 St. Clair Ave., Cleveland, Ohio.

Gear cutter, 60" Brown & Sharpe.
Grinder, No. 2 Cincinnati centerless, m.d., extra long bar rest.
Grinder, No. 4 Brown & Sharpe univ., m.d.
Lathe, 36"x20' Le Blond, q.c.g., m.d.
Press, EG-52 Ferracute, geared, coining.
Presses, 75 to 150 ton forge trimming. (4).

The Elyria Belting & Machinery Co.
Elyria - - - - - Ohio

Grinder, No. 11 Brown & Sharpe external.
Lathe, 16"x8' Fay & Egan.
Miller, No. 2 Pratt & Whitney plain horizontal.
Pipe threader, 10" Jarecki.

Wiener Machinery Co.
237 Centre St., - New York City

Lathe, Hendey, 24"x10', raised for 30" swing, yoke head, quick change.
Milling machine, 2B heavy Brown & Sharpe, s. p. dr.
Planer, Lodge & Davis, 24"x24"x6', regular m. d.

Alex Zeeve
2282 Woolworth Bldg., New York, N. Y.

Boring mill, horizontal, 7" bar.
Boring mills, vertical, 51" Bullard, 2 heads, m.d., 34" Rogers, spd.
Drill, radial, 3' American, gear box drive.
Gear hobbers, 24" Rhenania; 18" Schuchardt-Schutte.
Hammer, power, 75 lb. Beaudry "Champion".
Hammer, steam, 250 lb. Niles-Bement-Pond, sgle. fr.
Keyseaters, No. 3 & No. 2 Mitts-Merrill, No. 2 Baker.
Lathes, 39"x20' Rahn-Mayer-Carp, semi-q.c.; 29"x16' Walcott, q.c.g., taper, 24"x16' Whitcomb-Blaisdell, q.c.g.; taper, 24"x11' Lehmann, 16 speed gd. hd., md, taper, 21"x12' Le Blond, 12 speed gd. hd., m.d., tap., 20"x10' Lodge & Shipley, q.c.g., dbg. bowl head, 16"x6' Kimball-Walcott, 12 spd. gd. hd., spd., others.
Millers, No. 2A Milwaukee, plain, dble overarm, rapid traverse, spd.; No. 6 Whitney hand, m.d.
Planers, 24"x24"x8' Cin., 24"x24"x6', Pond, others.
Roll, pyramid, 10'x3" Hilles & Jones, drop-end, m.d.
Shaper, 20" Steptoe, heavy duty, b.g., cone.
Shear, 8'x3/4" Lennox, rotary splitting, m.d.

ALSO MANY OTHER TOOLS.

FOR SALE BY

Russell Machine Co.
438 Oliver Bldg. Pittsburgh, Pa.

Bend, roll H&J 10'x3/8" D.E., m.d.
Boring mill, 42" Bullard, 2 swivel heads, s.p.d.
Boring mill, horiz, 54" bar Niles, floor type.
Boring mill, horiz. 3-3/8" bar D&H, floor type.
Boring mill, horiz. 5" bar Barrett, b.d.
Gear cutter, spur, 84" Newark, m.d.
Gear planers, bevel, 54" Gleason m.d., (2).
Hammer, 300 lb. Bradley, upright strap.
Hammer, 1500 lb. Bliss board drop.
Lathe, 46"x17'6" Pond, p.c.g., triple grd., b.d.
Planer, 36"x36"x14' Gray, 4 heads, b.d.
Press, hyd. wheel, 300 ton Chambersburg, m.d.
Press, dbl. crank, 79-D Stoll, 3" str., m.d.
Shaper, 24" American high duty, b.d.
Shear, Alligator, No. 61 Carlin high knife, 2¾" sq.
Slotter, 18" Bem. Miles, table 36" dia., b.d.
Straightener, No. 1 Shuster flat strip metal, m. d.
Upsetting machines, 2½, 3½, 4 and 5" Ajax iron bed.

Bauer Machinery Company
1116 Frankford Ave., Philadelphia, Pa.

Drill, Henry & Wright, 24"x24" table.
Drill, radial, Fosdick 3', c.d.
Drill, radial, Bickford 3', c.d.
Grinders, internal, power feed to table, 10" swing, 12" feed, b.d., (8).
Grinder, No. 60 Heald, b.d.
Lathe, 27"x20', p.c.g., b.d.
Lathe, 21"x8' Sidney, q.c.g., d.b.g.
Lathe, turret, 16" Pratt & Whitney, 1¼", h. s., cross sliding turret, b.d.
Lathe, bench, brand new, high precision, 8½"x20" complete with collets up to 1".
Milling cutters, 9"x14" & 9"x19" with ins. h. s. blades.

National Machine & Tool Co.
Jackson, - - - - Mich.

Complete patterns, drawings, manufacturing rights, and stock of service parts for all Walcott lathes.

C. R. Daniels
1514 W. Capitol Drive, Milwaukee, Wis.

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Planer, 22"x22"x1', Wheeler, b.d. $250.00.
Tapping machine, ½" cap. Cincinnati, floor type.

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MICRO INTERNAL CYLINDER GRINDER
Belt driven, overhead countershaft, long spindle, grinds wet or dry, universal fixture for clamping work. In very good condition.
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Lathe, 24"x16 New Haven, loose change g..... 350
Shaper, 14" Steptoe, crank, plain cone drive..... 290

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Automatic, Cleveland, 1-¼ A. motorized, specially equipped, practically new.

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Milling machine, No. 2-M Potter & Johnson, auto.
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Planer, 48"x48"x11' Pond Plainfield3 heads, b.d.
Planer, 60"x60"x12' Pond, 2 heads, m.d.

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4' AJAX UPSETTING & FORGING Machine approx. wt. 69,000 lbs., floor space 12'8"x10'7", F.O.B. Boston.

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Boring mill, Niles 36", 2 swivel heads vertical.

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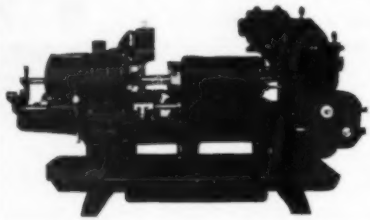

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Single Spdl. Avey, No. 2 Morse Taper
Single Spdl. Cinc. Bickford, No. 5 M. T.
Leland Gifford 2 Spdl. Hyd. Cycle
4 Spdl. Avey Sens.
4 Spdl. Leland Gifford
6 Spdl. Leland Gifford Sens.
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6"x10"x36" Norton Open-Side Surface
8" Heald Rotary Surface, arrd. M.D.
12" Pratt & Whitney Surf. (2)
No. 6 Besly Dbl. Opposed Disc

LATHES
12"x6' Reed Prentice
14"x6' Reed Prentice, M.D., with motor
16"x8' Reed Prentice Geared Hd. M.D.
14"x8' Seneca Falls Engine, with motor
18"x14' American, with motor
9"x20" Porter-Cable Mfg.
20"x10' LeBlond, M.D. with motor

LATHE, TURRET
3¼"x36" Cincinnati Acme, Geared Hd. Full Univ. No. 3

MILLS
No. 28 Ohio, with vert. att.
No. 8 Bilton Productomatic
No. 50 Bilton Productomatic
No. 15G Bilton Gear Millers

PLANERS
Lynd-Farquhar 26" combined O.S. Crank Planer & Shaper
24"x24"x6' Whitcomb, ctrshaft
30"x30"x10' Whitcb., ctrshaft
42"x42"x10' Detrick & Harvey O. S. 2 Rail hds., 1 side hd.

PRESSES
Max-Ams Double Crank Geared Power

SCREW MACHINES
No. 7 Bardons & Oliver
No. 4 Bardons & Oliver (4)
No. 2 Pratt & Whitney, 6 hole rd.

SHEARS
No. 748 Niagara Squaring, M. D. (2)
Oeking Comb. Punch & Shear
No. 14 Pettingell Sheet Metal
Rotary
Buffalo Armor Plate Bar Cut.
No. 2 Ryerson Lennox Throatless Bevel

HANCHETT TRAVELING WHEEL GRINDER, Type UK Class 500, Capacity 150" Length

MISCELLANEOUS
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Ingersoll Rand Compressor, 8"x3"x8" Absolutely Complete, 25 H. P. Motor
Magee Sheet Metal Wiring Edger (2)
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Lipe 2 Spdl. Gear Chamferer
Dings Magnetic Chip Separat.
Pettingell Bumping Hammer
Quickwork Sheet Mtl. Dbl. Bumping Hammer
No. 1U Bethel Player Lapper
W. F. Frazer Lapper
20 Ton Hanna Yoke Type Riv.
Oliver No. 36C Wood Saw Cut-Off
¾' Hubbell Horiz. Tapper
Webster & Perk Tapper
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4" bar Barrett Cylinder Boring Mchc. Work table 36"x10'6"
7" bar Barrett Cylinder Boring Mchc. Work table 54"x10'
12"bar Niles-Corliss Cylinder Boring Mchc. Arr. for M.D. Will mill or bore at a height of 60" over table and 10' long

BRAKES—PRESS TYPE

12' Ohl, B.M.D. Cap. ¼"

BUILDINGS

48'x120' Steel Building. Heavy Construction
48'x160' Steel Building. Heavy Construction

BULLDOZERS

No. 7 Ajax M.D. face of cross head 12"x76", Stroke 16"
No. 9 Williams & White, Arr. M. D. 24" stroke, 108"x20" Face of Crosshead

CRANES

3 ton P & H Span 220/3/60 A. C. 29'6"
5 ton P & H Span 230 Volt D. C. 52'2"
5 ton P & H Span 220 Volt D. C. 57'
7½ ton Northern Span 230 Volt D. C. 46'9"
10 ton P & H Span 230 Volt D. C. 29'7"
10 ton Alliance Span 220/3/60 A. C. 32'3¼"
10 ton Toledo Span 220/3/60 A. C. 32'3¼"
10 ton Alfred Box Span 220 Volt D. C. 72'3"
15 ton Shaw Span 230 Volt D. C. 46'
15 ton Niles Span 220/2/60 A. C. Including Phase Changer 48'11-¼"
15 ton Bedford Span 220/3/60 A. C. 52'
20 ton Case Span Hand Operated 55'
20 ton Whiting Span 220 Volt D. C. 60'
25 ton Niles Span 230 Volt D. C. 30'
30 ton Alliance Span 220/3/60 A. C. 10 ton Auxiliary 32'3¼"
50 ton Niles Span 220/3/60 A. C. 5 ton Auxiliary 30'6"

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4 ton Link-Belt Steel Gantry Crane 100' Span 4 motors, 220/3/60
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1000 lb. to 8000 lb. Chamb. B. & Sp. Erie, N-B-P Morgan

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48"x12' Britten Hydraulic Horizontal Sheet Stretcher Leveller, Motor Driven. Complete with triplex hydraulic pump.

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4" Landis, motor driven, complete with cutting 0" attachment and chamfering attachment
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16" William Pipe Threading Mch., M. D.

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42"x42"x12' Pond Three Head, T & L Pulley Drive
96"x96"x16' Betts, Two Head, Belt Drive

PRESSES—HYDRAULIC

300 ton Shell Piercing Press 4 column type. 46" Dia. of Ram. 48" stroke, 41"x65" between columns
500 ton United High Speed Forging Press Four Col. Type
760 ton Southwark, 41½x19" Between Columns
3000 ton Southwark, Forging Press, 3 column, 17" dia. 7" between Columns, 15 stroke 30" daylight

No. 96F Toledo Double Crank Press Tie Rod Construction 124" Between Uprights 12" Stroke Complete with 40 H.P. Mtr.

PRESSES—DOUBLE ACTING TOGGLE

No. 4 Bliss Tie Rod Construction, 10" Stroke of Blankholder, 14" Stroke of Slide, 34"x 31½" Area top of bed
No. 162 Toledo Punch Press Bed Area 21"x21", Stroke of Blankholder 5", Stroke of Plunger 8½"

PRESSES—SINGLE ACTING—STRAIGHT SIDE

No. 166½ Consolidated, 6" Stroke 47" between Uprights
No. 856 Toledo, rack and pinion press, Stroke around 5" to 36" Bed area 22"x22"

PRESSES—MISCELLANEOUS

1 D-45 Ferracute Press. Horizontal Double end screw type 36" ram stroke
No. 6 Bliss Horizontal Reducing Press B. D. 8" stroke

PUNCH—MULTIPLE

Hilles & J. No. 7, 98" Betw. Hous., 18" Thr. M.D. Cap. to punch 40 13/16" holes thru 1" plate. Equipment Thomas Spac. Table 22'6" long

PUNCH—SINGLE END

No. 6 Whiting Arr. M. D. 36" Throat, Cap. Punch 1" through 2"

PUNCH & SHEAR COMBINATIONS

No. 8 Whiting Sgle. End, Arr. for M. D. 48" Throat. Cap. Punch 1" thru 1"
Style E Clev. Sgle. End. Arr. for M. D. 27¼" throat. Cap. Punch 1" thru 1"
Style EF Clev. Sgle. End. M.D. 72" Throat. Cap. Punch 1¼" Through 1"
Style G Clev. Sgle. End Arr. for MD. 14" Throat. Cap. Punch 2" thru 1"
Style G Clev. Sgle. End Arr. for B.D. 26" Throat. Cap. Punch 2" thru 1"
Style G Clev. Dble End Arr. for M.D. 48" Throat. Cap. Punch 2" thru 1"
No. 2 Hilles & Jones Dble. End Arr. for M.D. Cap. Punch 1" thru 1". 25" throat
Size F Niles-Bement-Pond Sgle. End. Arr. for M.D. 18" throat Cap. Punch 4" thru 2"
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10' Bertsch Initial Type, B.D., Cap. 3/16", 2.66" Corrug.

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10x9" Acme Four Stand 2 High
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10" Lewis Bar Mill with 20" breakdown mill
10" Garrison Bar Mill 5 stand 3 high
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Mesta Guillotine Type Steel Frame Arr. M.D. Cap. 6" Sq.
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Mesta Vertical Open Throat Sheet Bar Shear M.D. Capacity four 1¼"x8" Cold Bars. Complete with tables

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20x 8	L & S	QCG	MD
24x14	L & S	QCG	MD
20x 8	Hendy	QCG	TA
18x 8	Sidney	QCG	TA
14x 6	Willard	Semi	QCG
20x12	Draper	TA	

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24" Cincinnati Back geared
16" Gould & Eberhardt back geared

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Detrick & Harvey Horizontal 3½" bar

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B & S No. 12 Cylindrical

PLANER

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GARVIN No. 2 and 3 Duplex Millers, countershaft.
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14′-20′ N.B.P. 3 M.D.
84″ Betts, Heavy 77″ swing
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3″x18″ Norton, Self Cont. (7)
15″x15″x96″ Norton Open-side Surface, M.D.
16″x8″ Landis Crankshaft
No. 6 Bryant Chucking
No. 2 Landis Universal
No. 2 Sellers Univ. Tool
18″ Besly No. 26 Disc
18″ Badger No. 220 Disc
20″x96″ Landis Cyl. M. D.
20′x96″ Landis Univ.
24″x 96″ Landis Cyl. M. D.
18″ x216″ Landis Cyl. M. D.
30″ x 240″ Landis Roll M. D.
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90″ Bridgeport Shear Knife

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9″x20″ Porter-Cable
12″x5½′ Seneca Falls
14″x6′ American Q. C. G.
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15″ Sundstrand Stub Lathe, M.D.
16″x6′ Sidney, Q.C.G.
18″x8′ Whitcomb-Bl., grd., hd., M.D.
19″x12′ LeBlond Grd. Hd.
20″x12′ Amer. 3 cone
20″x12′ Hendey, Q.C.G., Cone
20″x14′ Monarch, Q.C.G.
20″/42″x10′ Fay Scott, Gap, M.D.
21″x8′ Conradson, Grd. Hd.
22″x12′ Amer. 4 cone
22″/24″x12′ L. & S., Q.C.G., M.D.

LATHES (Continued)

24″x10′ Amer. Grd. Hd.
24″x12′ Putnam Grd. Hd., M.D.
24″x12′ Reed Prentice, Grd. Head, T. A.
24″x15′ N.B.P. Q.C.G., T.A.
26″x11′ Wickes Heavy Cone
24″/32″x24′ LeBlond Q.C.G. cone, raised in sand
30″x12′ L. & S. Cone, Q.C.G.
30″x16′ N.B.P. Axel & Journal, Center Drive, M.D.
32″x18′ Fifield, triple grd.
36″x14′ Rahn Larmon, Q.C.G., Cone
36″x27′ Pond 2 carr., Cone
36″x27′ Gleason, F. Plate Dr.
42″x30′ Johnson Grd. Hd. M.D.
42″ N.B.P. Center Dr. Whl.
48″/66″x14′ Putnam, Heavy
48″x16′ Fifield Cone
54″x38′ Niles Cone Drive
90″ N.B.P. Heavy, Wheel
Peerless Banding Lathe, M.D.

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No. 2B K. & T. Univ.
No. 2 Cincinnati, Plain
No. 3 Newt. Miller, 30″x30″x8′
No. 3 Ingersoll Knee Type Vert. & Horizontal Spindle
3B K. & T. Universal
No. 4B Becker Vert.
No. 5 Cincinnati, Plain
No. 6 Becker Vert. M. D.
No. 12 P. & W. Profiler
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28″ Cincinnati Semi Auto
42″x42″x8′ Bement Pond, Adj. Rail Miller, 4 hds., hd.
No. 6 Jackson Die Sinkers (3)
No. 1 Standard Hand

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42″x42″x16′ N.B.P., M.D.
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30″x30″x10′ D. & H. Openside
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16″x16″x48″ Walter Bros.

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2½″x26″ P. & W. Grd. Hd.
No. 3 Bardons & Oliver Fox Lathe
3A Warner & Swasey M. D. Lathe
No. 4 Bardons & Oliver Fox
No. 4 Foster, 1-9/16″ capty.
21″ Gisholt, 3 step cone
24″ Gisholt 6½″ H.S., M.D.
24″ Steinle M. D.
28″ Steinle M. D.
Bardons & Oliver Fox Type
2½″x24″ & 3″x36′ J. & L.

MISCELLANEOUS

Automatics ⅜″, 1½″, & 2″ Clevel. Model A Sgl. Sp.
Automatics 1¼″ Gridley 4 spin. Model F.
Automatic, 2¼″ Gridley, 1 Sp.
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Bolt Threader, 2″ Natl.
Bolt Threader, 2″ Wms., Dble. Head, Motor Drive
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Die Sinkers, No. 6 Jackson (3)
Gear Cutters No. 3 & 4 Adams Gear Hobbers
Gear Cutter, 48″ Cinci.
Gear Cutter, 110″ Newton Spur
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Hammer, No. 3B Nazel M.D.
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Header, 2″ Acme Steel
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Keystrs., Nos. 4 & 6 M & M. M.D.
Pipe Mach. 8″ & 12″ Williams
Pipe Machine, 12″ Saunders
Pipe Mach., 12″ Curtis & C.
Pipe Machs. 3″ Stover M.D.
Pipe Mach., 2″ Bignall Keeler
Press, No. 3A Bliss, Dble. Ck.
Press, No. 61 Spec. V. & O.
Presses, No. 18 Bliss B. & Fl.
Punch & Shear, Schatz Cobn.
Punch, 1″x¾″ shears, ¾″ pl.
Punch 54″ H & J No. 2 D.E.
Rolls, 6′x½″ H. & J. No. 2
Rolls, 8″x½″ H. & J. No. 2
Rolls, 12′ Corrugating—Heavy
Saw, 6″ Avey Milband
Saw, 6″ Gorton No. 2B Inter.
Shaper, 16″ Steptoe M. D.
Shaper, 36″ Morton, railroad
Shaper, 32″ Morton Draw Cut
Shaper, 24″ Ohio, Cn. or M.D.
Shaper 24″ Rockford. cone or M.D.
Shaper, 28″ Ohio Dreadnaught M.D.
Shaper, 16″ Stockbridge Cone
Slotter, 15″ Putn., D.C., M.D.
Slotter, 18″ Newton, Hvy. D.
Slotter, 24″ Dill A.C., M.D.

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LeBlond, 20"x10', q.c.
Hendey, 16"x10', m.d.
Sidney, 16"x8', m.d., d.b.q.
12, 14, 16" LeBlond. American,—Monarch, —Mulliner,—Lodge and Shipley and many others

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No. 2 Reed m.d.
No. 60 Heald
Ott Universal
Ott plain

MILLERS

No. 24 B & S, 14"x60" table
No. 15 Garvin, 12"x62" table
No. 3 Cincinnati
No. 3 universal Cincinnati
Oesterlein 24x7½x18", m.d.
No. 1 Milwaukee, m.d.
No. 3 Becker vertical, m.d.
No. 1 Lodge & Davis univ. miller
Garvin, Sloan & Chase, and other small millers in stock

RADIAL DRILLS

American 30", geared box, single pulley drive
Simplex, 3', cone drive

BORING MILL

60" Rogers, m.d.

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DRILLS

No. 310 Baker, H. D.
(3) Baush Multiple Spindle Drills, Very Low Price
No. 25½ Foote-Burt Heavy Duty Prod., No. 6 Morse Taper, Motor Drive
4' Prentice Radial
4 Spindle Barnes Gang Drill

GRINDERS

16x42" Landis Pl. Cyl., Self-Cont., Mtr. Dr.
No. 3 Diamond Surface, 48" Travel, All Feeds
No. 78 Wilmarth & Morman Surface

LATHES

14"x6' Flather, Q.C.G.
14-28"x7' Barnes Sliding Bed Gap, Loose Change Gear
24"x12' Porter, Q.C.G., M. Dr. & M.
24"x8' South Bend, H.D., L.C.G.
11"x4' Seneca Falls Short-Cut, M.D.

TURRET LATHES

(3) Warner Swasey & American Fox Monitor type with complete equipt. & auto. chuck
No. 4 Bardons & Oliver, Hex Turret, for Chkg.
No. 3 Superior Turret Lathe, Automatic Chucking Bar Feed
26"x4¼" Hole Libby Geared Head Full Universal Turret Lathe, Face Plates, Pot Chucks, Boring Bars, Turret tools. Rebuilt.
6A Potter & Johnson Auto. Air Chuck & M.D. Ser. 18814

MILLS

No. 33 Brown & Sharpe Manf. Type Rapid Traverse S.P.D.
No. 2-V Brown & Sharpe Plain, with V. Hd.
No. 3 and No. 4 Cincinnati Plain (Knuckle)
8' Burr Keyseating Mill
No. 2-A Becker Vertical Mill

MISCELLANEOUS

2"-3" Buffalo Armor Plate Bar Shear M.D.
2-No. 12 Barber Colman Gear Hobbers
1-34"x11 Wickes Crankshaft Lathe M.D.
20" Walcott H. Duty Shaper
(2) No. 5½B Hi-speed Riveters M.D.
(7) ¼"-1¼" 4 Spdl. Gridley Model F automatics, with collets, Threading Spindles
3-1" Sgle. Spdl. Gridley Auto., Bar Equip.
42" Wickes Blue Print Machine, M.D., Model No. 3
No. 3 Brown & Sharpe Gear Cutter
32" Cincinnati Gear Cutter
24"x24"x8' American Planer, Motor Dr.
(2) 900 Ton Zeh & Hahnemann Percussion Presses, M. Dr., 25" Stroke, Bed 36x50", Tie Rod, Like New
(2) 9x9" Peerless Shaping Saws
20" Columbia Shaper, M. Dr.
20" Ohio Shaper, M. Dr.
3'x16 Ga. Bertsch Foot Gap Shear
Gleason Spiral Cutter Grinder M.D.
2-15 Ton Hercules Broaching Presses 15" stroke M.D.

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2¼" Gridley Single Spindle
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4¼" Gridley Single Spindle

BORING MACHINES

2½" Bar Universal
No. 72-4⅝" Bar Niles-Bement-Pond, Duplex Control
No. 2 Barrett, 5" bar, extension bed.

BORING MILLS

30" Bullard
42" Niles-Bement-Pond
54" Colburn.
60" Gisholt, M.D.
72" Bickford.
76" Bullard

DRILLS

1, 2, 4 Spdl. Leland-Gifford.
No. 2-4 Spdl. Leland-Gifford, Motor Spindles. Power Feed
1, 2, 4 Spdl. Henry & Wright.
No. 2 Colburn, 4 Spindle.
No. 4—5 spdl. Foote-Burt.
No. 1 Baush Multiple
No. 3 Baush Multiple
18 Spindle Baush
5' Western Plain
7' American Full Universal.
8' Western heavy.

GEAR CUTTERS

No. 2 Barber-Colman Hobber.
No. 12 Barber-Colman Hobber.
No. ½, Pfauter Hobber.
No. 2—36" Pfauter Hobber
No. 3-26" Brown & Sharpe.
No. 4-48" Brown & Sharpe.
No. 5-48" Brown & Sharpe
No. 6-72" Brown & Sharpe.
No. 6-A-72" Cincinnati.
96" Newton Spur Gear
Nos. 6, 61, 62 Fellows
No. 36-BM G. & E. Bevel Rougher

GRINDERS

No. 70 Heald Internal
No. 2½ Universal (Bath type).
10"x36" Thompson Universal
No. 4-12"x66" Landis Universal.
8" Arter Rotary Surface
No. 5 Springfield Planer Surface

MFG. LATHES

3½"x36" Fitchburg Lo-Swing.
3½"x60" Fitchburg Lo-Swing.
3½"x108" Fitchburg Lo-Swing.
8"x60" Fitchburg Lo-Swing.
No. 4-AC LeBlond Auto. Crankshaft

ENGINE LATHES

18"x6' Bradford
18"x8' Lodge & Shipley.
24"x12' American.
24"x13' Chard.
24"x16' Lodge & Shipley.
24"x18' Lodge & Shipley.
24"x20' Lodge & Shipley, Geared Head.
24"x22' Lodge & Shipley, Taper.
25"x10' LeBlond Heavy Duty.
26"x8', 10' Bridgeford
27"x18' American
30"x12' Lodge & Shipley
30"x12' Whitcomb-Blaisdell
36"x16' American, taper.
36"x24' Bradford, taper att.
20"-40"x10' Rahn - Larmon Geared Head Sliding Bed Gap.
40"x12' Fifield
60" New Haven Turning & Boring

MILLERS

No. 3 Becker-Brainard Plain.
No. 3 Brown & Sharpe Plain
No. 5 Brown & Sharpe Vertical.
No. 5-B Becker Vertical.
No. 6 Becker Vertical.
Type "B" Briggs
24"x24"x12' Ingersoll Adj. Rail.
24"x20' Ingersoll Double Faced
36"x36"x12' Newton Duplex.
38"x44"x20' Ingersoll Slab.
72"x16"x14' Ingersoll Slab.
No. 1 Smalley-General Thread.

PLANERS

24"x24"x6' Powell.
24"x24"x6' Rockford.
24"x24"x6' Cincinnati, 2 heads.
24"x24"x12' Gray.
30"x30"x8' American.
30"x30"x8' Powell.
36"x36"x8', 18' Cincinnati.
36"x36"x12' American 2 hds.
42"x42"x14' Gray, 2 heads.
48"x48"x10' Niles-Bement-Pond, 2 heads.
60"x48"x20' Hamilton, 3 heads.
72"x60'x16' American, 4 heads.

PRESSES

No. 01 V.&O., M.D.
No. 1 V.&O., M.D.
No. 303 Bliss S.S., Geared.
No. 58 Toledo Nosing.
No. 42½ Pels Beam Shear
No. 178 Toledo Toggle Drawing

TURRET LATHES

18" Dreses Fox, Chasing Bar
2¼"x26" Greenlee
3¼"x40" Greenlee
3"x36" J. & L. 2 spdl.
18" Libby
24" Steinle, 6¼" H.S.
24" Gisholt, 6¼" H.S.
26" Libby, 7½" H. S., M.D.

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4-⅜" Gridley, single spindle
Hayden ¾" 5-spindle
⅞" Model B Cleveland (2)

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Allen 6-spindle 14" M.D.
24" Sibley & Ware
4-spindle Reed
4-spindle Woodward & Rog.
No. 33 Radial, bench model
10" Excelsior
20" Barnes
20" Superior
½" Commander Electric
½" Utility, Electric
20" Silver
24" Aurora
14" Meyers
14" Barnes
Natco Minister, Multiple
24" Sibley, single spindle
3' Carlton Radial (2) sensitive
3' American Radial (2) sens.
Weigle Vertical 1 spindle (3)
No. 2 Foote-Burt Rail 6-spdl.
Bausch Multiple, 8-spindle

GRINDERS
6x32 Norton Plain
No. 2 Modern Univ. 12"x24"
No. 2 Cincinnati Plain
No. 2 Brown & Sharpe Surf.
No. 1 Landis Universal
10"x36" Norton Plain Cyl.

LATHES
38"x22' Fitchburg
12"x4 American 47AP Bench
14" Hamilton LCG
26"x10' Bridgeford
12"x5' Sheldon (new)
14"x5' LeBlond Production (2)
14"x6' American, mtr. in base
14"x6' Lodge & Shipley QCG
14"x7' Davis, QCG MD.
16"x6' Monarch QCG MD.
17"x6' Sidney MD.
18"x8' Lodge & Shipley
18"x8' Walcott
5"x5' Fitchburg LoSwing (4)
20"x10' Lodge & Shipley
No. 6 LeBlond Multi. Cut (4)
16"x6' Rockford Plain (2)
16"x6' LeBlond
16"x8' Hendey

MILLING MACHINES
No. 1½B Milwaukee, Special Universal
No. 39-H Index High Speed Vertical (new)
No. 2 Kempsmith Universal
No. 1 Kempsmith Universal
No. 2 Kempsmith Plain
No. 4B Becker Vertical
Oesterlein Plain (2)
Ingersoll Slab

SHAPERS
8" Shape Rite (new)
20" Davis MD.
20" Gould & Eberhardt
20" Kelly MD.
20" Stockbridge

PLANERS
Ohio 24x24x6
Yager, Wood
4" Wallace, bench

TURRET LATHES
No. 6 Brown & Sharpe (2)
21" Gisholt (2)
24" Gisholt
No. 4½ Bardons & Oliver

MISCELLANEOUS
Garvin Cam Cutters
8" Gleason Bevel Gear Generators (2)
24"x8" G&E Gear & Bevel Cut.
No. 3 LaPointe Broach (2)
Combination Woodworking Machine
Vertical Heads
Dividing Heads
No. 101 Niagara Punch Press
No. PG5 Ferracute Press
Famco Presses (new)
Rousselle's (new)
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5x6 Racine Hack Saw
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DRILLS
4 Ft. Mueller Radial, oil groove
3 Ft. Silver Radial, oil groove
Rockford 4 spindle, No. 4 M. T.
No. 12 Natco Multiple Spindle
No. 5 Fox Multiple Spindle
Natco 3 way Horizontal multi. spdl.

GEAR CUTTERS
No. 6 Fellows
No. 18H Gould & Eberhardt
No. 12 Barber Colman
6" Gleason Straight Bevel
15" Gleason Spiral Bevel

GRINDERS—Cylindrical
8x36" Brown & Sharpe
18x96" Brown & Sharpe
16x50" Norton Crankshaft
No. 20 Bryant Chucking

GRINDERS—Rotary
No. 200 and No. 210 Heald—8" chuck

LATHES
15"x8' Carroll & Jamison, grd. hd.
22"x14' Bradford, geared head
20"x12' Rahn Larmon
24"x10' Bradford
24"x14' Lodge & Shipley
No. 6 LeBlond Multicut
11"x5' LeBlond Production—grd. hd.
3½"x60" Fitchburg Lo-swing
24"x12' Lodge & Shipley Duplex Crankshaft

LATHES—Turret
No. 4 and No. 6 Warner & Swasey
No. 4 Warner & Swasey Universal
No. 5 Foster
No. 7 Foster
No. 4 Millholland
No. 4½ Bardons & Oliver
No. 7 Bardons & Oliver
No. 9 Bardons & Oliver
No. 10 Bardons & Oliver
2¼"x24" Jones & Lamson

MILLS—Boring
No. 3 Binsee Horizontal

MILLS—Plain
No. 2 Cincinnati—S.P.D.
No. 2 Rockford—C.D.
No. 2½ Rockford—C.D.
No. 2 Brown & Sharpe C.D.
No. 1B Brown & Sharpe C.D.
No 33 Kempsmith S.P.D.

MILLS—Universal
No. 2 Cincinnati—C.D.
No. 1½ Rockford—C.D.

PLANERS
24x24x6' American
36x36x10' Pond
36x36x14' Detrick & Harvey—Open-side

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16" to 24" Gould & Eberhardt
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21" WEIGEL Upright, Sliding Head
22" BARNES Upright, Sliding Head
42" CINCINNATI Upright, Sliding Head
14-spindle BAUSCH, rectangular
No. 12 P&W bored for 12 spindles
No. 15 BAUSCH 15 2-½" spindles
No. 48 BAUSCH 20 2-½" spindles
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D-4 COLBURN S.P.D. No. 5 Taper
D-3 MINSTER S.P.D. No. 6 Taper

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2 H. P. 230 V. DC 2"x12" wheels
GISHOLT Universal Tool 1-¾ square
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60" SPRINGFIELD Knife Grinder
55 HEALD, a new machine M.D.
No. 2 B&S Surface

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24"x8" B&S automatic
36"x10" B&S automatic
60"x16" NEWARK automatic
64"x20" G&E "New Type"
90" P&W Spur and Worm
Nos. 3 & 4 ADAMS Hobbers

LATHES

16"x11' P&W Geared Head
24'x10' SPRINGFIELD Geared Head
27"x12' LeBLOND D.C. Geared Head
30"x12' LODGE-SHIPLEY Geared Head
36"x48' BRIDGEFORD Geared Head
42"x18' N.B.P. D.C. Geared Head

PLANERS

72"x72"x10' N.B.P. Rev. M.D.
120'x96"x25' D&H Convertible
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Prentice, 4-spdl. high-speed
Allen BB Type B sgl. spdl.
Demco DAH 2" bb. M.D.
14" U. S. $35.00
20" Barnes B. G. & P. F.
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28" Hamilton sl. hd. BG & PF.

GRINDERS:
Cutter & Reamer, No 1 Cinci.
Disc, No. 6-20 Besly
Disc, No. 41 Besly, motor dr.
Disc, No. 220 Badger & press
Drill, New Yankee, D.E.
Elec., Hisey-Wolf 3-6 BOA BB
Flex. shaft, RA 5 Haskins
Emery, DE, Norton 24"
Emery, DE St. Louis 18"&20" Internal, Madison; No. 65 Heald.
Plain Cylindrical, No. 2 Morse
Surface, No. 1 La Salle.

LATHES:
26"x14' Niles, PCG
20"x8' LeBlond QCG, DBG
20"x8' Bradford, PCG MD.
18"x8½' Rahn & Mayer PCG
16"x8' Fay & Scott QCG
16"x8' LeBlond PCG
16"x6' Monarch DBG QCG
14"x6' Rumsey, PCG
9"x3' South Bend 420-Y MD.

LATHES—Turret:
2x24" Jones & Lamson
12" Reed-Prentice BG

PRESSES:
Arbor, Famco and Atlas.
Cam Drawing, 69-N Bliss
Dbl. Crank, No. 37 Excelsior
Foot, Famco and No. 4 Swaine
OBI, Wold, 1350 lbs.
Punch, No. 5 Bliss Stiles
No. 20 Excelsior ¼" in ¼"

PUNCHES & SHEARS:
SE, Cleveland C ¾ in ¾", 26" thr.
SE W-W 14½, 25" thr. 1 in 1" MD
Rock River L, 24" thr. ½ in ½"
DE 1-10 Badger ½ in ½", 10" thr.

SAWS:
Band metal, 14" Racine
Cold, Higley, 20" saw, No. 17
Hack, No. 3 Robertson 6x6"
Hack, No. 14 Atkins 6x6"

SHEARS:
Rotary Bevel, Lennox ⅜"
Square, 48" Excelsior, pwr. gap.
Square, 38" Bertsch, power
Square, 36" D&K, 16 ga. pwr.
Throatless, 18 H Marshalltown

THREADERS, Pipe & Bolt:
Murchey, 2" dbl. head, bolt
Pipe, 2" Oster No. 302

MISCELLANEOUS:
Bender, No. 15 Wallace, 1" cap.
Dbl. Seamer, Swaine, 36" cap.
Compressor, Herron-Bury CCB, 14x9x8", 6' tank, 20 HP mtr.
Hammer, 50-lb. Little Giant, MD.
Jacks, Lever Lift, 15 ton J. C. Miller, No. 14 Valley univ.
Planer, 36"x30"x8' Wheeler
Roll, Corrugating, 10' Robinson
Screw Mach., No. 2 Jones & Lamson
Shaper, 26" Hendey planer type dr.
Welders 2½, 5, 7½, 10 K W Dyer spot
Valve Refacer, ½" Black & Decker

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BORING LATHE—Springfield 14"x10' bed 7" hole

BORING MILLS—Baush 44" m.d. Bullard 51" Vert., 2 hds., Bullard 42" Mill, vert.; Rockf. No. 2 horiz., 3¼" Bar; Colburn 42" Vert. 2 Hds.; Colburn 42" one head.

BRAKES—D. & K., 5' Box & Pan, 14 ga. Keene 10' 16 ga. Toggle Press.

CUT-OFF MACHINE—Davis 6" cap.

DRILLS (RADIAL)—Fosdick4', Carlton 4' all gear box dr.; Hammond 4' sensitive; Mueller 4½' g. box; Bickford 4' Gr. Box.

DRILLS (H. S. B. B.)—H & W 2, 4, 5sp.; Sipp 1 & 2 sp.; Allen 2 & 6-sp.; Avey, Demco, Lel-Gif. 1-sp.; Avey 2-sp.

DRILLS (MISC.)—Baker No. 217 (2) Hvy. Duty; Hamilton 42" S. H.; Barnes 20" & 24" 1-sp. & 20" 4-sp.; P W No. 12 Multi-Sp.; Natco 20 sp. Rect. head; P. & W. 24 sp. rectangular head Adj.

GEAR CUTTERS—B & S 26" s. p. d. automatic spur; Cincinnati 36" gear cutter. G. & E. 48" gear Cutter.

GRINDERS—P & W 12" vert. surf.; Cin. No. 1½ & B & S No. 12 univ. tool, B & S Nos. 11&16 pl. ; B & S No. 2 and Abrasive No. 33 Surf. Heald Nos. 60 & 65 Int.; Landis 10x30" Plain; B & S 10x48"; 3—Norton 6x32" plain; badger No. 220, auto. d. e., opposed disc (4); Norton 10" x 36". Diamond No. 2 Auto. Surf.; Ott 5"x18"

HAMMERS—Mayer 50-lb.; W & W 165 lb.; Kane & Roach 70 lb.; Beaudry 150 lb.

KEYSEATERS—Mitts & Merrill No. 5 vert. Davis No. 1; M. & M. No.0; M. & M. No. 2.

LATHES—Monarch 16"x10' M.D.; Lehmann 18"x9'; Amer. 22x8'; Davis 22"x10'; L & S 20"x10'; S-B & E 20"x10' q. c. g; Flather 22"x10'; LeBlond 16"x8'; Gleason 45"x12'; Monarch 16"x8' (2); Ryerson 20x10', m.d.; S.B.E. 30"x12' Q.C.G. Hendey 16"x8' C.H.; Hendey 16"x10' grd. hd.; Sidney 18"x8' and Flather 16"x8'. L. & S. 16"x8' M.D.

MILLING MACHINES—Ohio No. 29, Ohio No. 20, Cin. No. 3, Hendey No. 3, B & S No. 3, LeBlond No. 3H, Cinc. No. 1 s.p.d. Plain; LeBlond No. 4 M.D. C.D. & Cleveland; No. 2, s.p.d. Plain Cinc. 24' Auto. Plain; Model "B" Vertical; Owen Duplex; Ingersoll M.D. Slab Miller 4 hds.; Newton Vert. with rotary table; Becker No. 2 Vert.

THREAD MILLERS—Lees-Bradner No. 3 Collet Type; Smalley General No. 23-A; Moline No. 10

PLANERS—Gray 28"x28"x6' 1-hd.; Pond 32"x34"x10'; Sellers 36x36x12'; Pease 26"x26"x9'; Pond 54"x54"x12' 4 hds.

PIPE MACH.—Williams 6" cap.

PUNCH PRESSES—Federal Nos. 1, 2, 3 o.b.i.; Ferracute No. P-4; Fer. No. EGF 52 Coining; Willard No. 4A o.b.i.; Swaine No. 38 arch, Swaine No. 37 O.B.I.; and Bliss No. 68-N; Cons. No. 24 Blanking; Bliss No. 20.

SAWS (HACK)—Peerless 6x6" H.S. (4); Atkins 8x8"; Peerless 13x13" M.D.

SAWS (COLD)—Cochrane & Bly Nos. 2-B & 4-B; Peerless 6x6 Univ. Shaping.

SHAPERS—S & M, G & E, Ohio, Mi., Q. City, Davis, Cin. 16"; Ohio & G & E 20"; S & M, Q. City, Rock, Cin. 24"; Ohio 26"; Cin. 24" s. p. qr. box; American 24" heavy, b.g. Amer. 15"; Springf. 15"; S.&M. 26", b.g. G. & E. 24", s.p., gearbox; Amer. 20"; Rockf. 24" gearbox.

SCREW MACHINES—8 Hand; Nat. Acme. Nos. 515, 4-sp.; B.&S. No. 4 Hand; Nat. Acme No. 52; Gridley 4-sp. ¾"; Cleveland 1-sp. 2¼" cap.

SLOTTER—Bement-Miles 10" vert.

TAPPING MACHINES—(2) Garvin No. 2 & 2X Vertical Automatic & Garvin No. 1.

TURRET LATHES—Baush 30" M.D.; Bullard 24" vert. rap. prod.; Potter & Johnston, 8½x16 No. 10; Libby 24", m.d.; Gisholt 24" swing 6¼" hole; P. & W. 2¼" hole grd. hd.

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Brown & Sharpe No. 1—M.D.
Cleveland, Model A, ⅝, 1¼, 2 & 2¼"
Cleveland, Model M, 1½" 4 spdle.
New Britain, No. 22 & 33
Gridley, Model F, 4 spindle, ⅞, 1¼" & 1¾"
Automatic Threading Lathes, 13"x6' G.H.
BORING MILLS, 42" King, 2 Swivel Head
54" Niles, 2 Swivel Head

DRILLS, Edlund, No. 1A, 4 spdl. P.f. No. 3 M.t.
Foote-Burt, Heavy Duty No. 24
Baush & Natco Multiple spindles

GEAR CUTTERS, Brown & Sharpe No. 4-48"
Fellows No. 61 Shaper

GEAR HOBBERS, Lees-B No. 5 & 5A
Brown & Sharpe No. 14—10x36" M.D.

GRINDERS, Heald Nos. 55, 60, & 65
Landis, 10x24" Self Contd.
Norton, 16x36" Crankshaft
Norton, 10x18, 24 & 36" Plain
Cincinnati Face Mill, Excello M.D. spdle.

LATHES, Hendey, q.c. 14x6 & 18"x10'
Hamilton, 16"x6' Cone, Q.C.
National, 18x8' Cone, Q.C.
Schumacher & Boye, 24"x10' Cone, Q.C.
No. 7 Foster Turret & 21" Davis M.D.

MILLS, Newton No. 2 Key Seat
Rockford No. 2B Universal Complete, Western Drive & Motor
No. 13B Brown & Sharpe
Type B Briggs, No. 32 Kempsmith

PLANERS, 30"x30"x18' Gray, 2 heads
44"x44"x18' Niles, 4 heads

PRESSES, No. 94 Bliss, Solid Back
No. 661 Toledo 150 ton Embossing
No. 6 & 7A Niagara O.B.I.

SHAPERS, 24" Queen City Cone
14" Gould & Eberhardt, M.D. & Reeves.

SLOTTERS, 3½" Rhodes, M.D. 8" R.T.
5½" Industrial—18" Rotary Table

TAPPERS, No. 1, 2 & 2X Garvin
6 Spdl. Holmes Tilted No. 3

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19"x8' Sidney Q. C. Gr. Cone Hd. L.
20x8' Hamilton Grd. Mfg. Lathe
24"x14' S. & B. Cone Hd. Lathe
32x28 Bullard Triple Grd.
Hardinge Bros. Pre. Bench Lathe
Rockford Dbl. End Hydraulic, m.d.
1½" Landis Dbl. Bolt Cutter, b.d.
2" Landis Dbl. Bolt Cutter, b.d.
3" Landis Sgle. Bolt Cut., leadscrew
C-13H Natco Hydraulic Mult. Drill
No. 13 NATCO Drill with tapp. att.
No. 14 NATCO Drill with tapp. att.
No. 14 Natco 16x24 Multiple Drill
No. 30 NATCO 24x40 Multiple Drill
No. 40 Natco Straight Line Mult.Drill
No. 60 NATCO 3-Way Mult. Drill
3' Carlton Sensitive Radial Drill
4' Hammond Sensitive Radial
6' Prentice Plain Radial, cone dr.
Avey No. 3 Dbl. Spdle. Horiz. Drill
20" Cinci. 4-spdl. Slid. Hd. Gang Drills
Rowbottom Cam Cutting Machine
No. 6 Jackson Die Sink. Machine
No. 4 B&S Auto. Gear Cutter
No. 400 Curtis Oil Extractor
No. 304A Oster Pipe Machine
Ingersoll Tub Type Face Mill Grdr.
12x48 Queen City Pl. Grinder, self contained
Sellers Drill Grinder, t&l. pul. dr.
No. 251-W New Barrett M.D. Centrifugal Washer
24x6 Gray Planer, 1 hd.
24x24x8 Hamilton Planer, 2 hds.
24" American Shaper, sgl. pulley

WE CARRY A LARGE STOCK OF USED MACHINE TOOLS.
Your inquiries will be appreciated.

The Strong, Carlisle & Hammond Company

1392 West Third Street, CLEVELAND, OHIO

Branch Office: 2832 East Grand Blvd. DETROIT, MICHIGAN

LIKE MAGIC FROM STOCK

AUTOMATICS:
No. 52 Acme
No. 53 Acme
1¼" Gridley Model "F"
12x6 J&L Hartness Chucker

BRAKES:
8'x3/16" Ohl Press Brake, large variety Dies; M.D.
3' Hand Box & Pan Brake, 14 ga. D&K
3' Hand Bending, 14 ga. D&K.

BORING MILLS:
52" Niles Tool Works
24" Bullard Vert. "New Era"

THREAD MILLER:
Smalley General 6" hole in spindle, Belt Drive

SHEARS:
No. 196 Niagara 8'x16 ga. Foot Power. Equal to new
No. 748 Niagara Grd. M.D. (3) 48"x3/16" capacity
No. 236 Niagara Grd. Underdriven; M.D. 36"x14 ga.
10'x¼" Waiss & Roos M.D. 24" gap

IRONWORKERS:
No. 1 Buffalo, Univ. 3x3x½" angles
No. 0 Buffalo Bar Shear, 2x2x¼" angles
No. 1 Pels Hand Univ. Ironwkr.

DRILLS—HEAVY DUTY UPRIGHT:
Baker No. 216; No. 121
Colburn No. 2
Foote Burt No. 25 like new
Snyder 36"; No. 5 Tap. 28";24"
Barnes 24" Slid. Hd. 21" 20"
Cinc.-Bick. 28" Tapping Attch.
Cincinnati 24"; 21"
Aurora 24" with Tapping Spdl.

DRILLS—Sensitive High Speed:
No. 3 Avey Sgl. & Mult. Spdl.
Avey No. 2 Sgl. & Mult. Spdl.
Lel. Gifford Single, 2 & 4 spindles
Henry & Wright Single, and two spindle No. 2
Kokomo Nos. 3 & 2 Single Spdle.
Fosdick No. 2 Super Speed with Tapping Att.
Moline No. 5 Hole Hog, 6 spdl. Rail
Harrington No. 2, 12 spindle Multiple, Like New
Fox Multiple Spindle. No. 2 M.T.; 8 spindles
Natco No. 11; 12 spdls., No. 1 M.T.
100 spindles additional Drills all sizes

RADIAL DRILLS:
6' NBP 15" column
5' American 13" column
4' Cincinnati Bickford 11" col.
4' Rickford 11" column
4' NBP 11" column; Semi-Univ.
3½' Silver 9" column
3' American 9" column
3' Mueller 9" column
3' Dreser 9" column
3' Dreses (Simplex)
3' Carlton Sensitive, M.D.
4' Dreses Flat Column

LATHES:
4"x104" LoSwing Fitchburg (2)
4"x60" LoSwing Fitchburg (3)
4"x48" LoSwing Fitchburg (2)
9"x42" So. Bend Bench Lathe
8"x36" American Bench Lathe
12"x5' Willard Geared Head
13"x6' P & W Cage - Makers
13"x6' Willard, cone drive
14"x6' Stand. Lathe Wks., cone
14"x6' Rockford, Q.C.G.,cone dr.
14"x8' LeBlond Tool Rm., cone
14"x8' Hendey, Geared Head
14"x6' LeBlond, Q.C.G., c. d.
14"x6' L&S, q. c. g., cone
16"x6' L&S, 12 spd., grd. head
16"x6' Monarch Q.C.G. cone dr.
16"x6' P & W, plain chg.; c.d.
16"x6' Reed Plain Change; c.d.
16"x8' Cinc. Q.C.G., c.dr., Taper
16"x8' Cincinnati, QCG, cone dr.
16"x10' Reed-Pren., Q.C.G., c.d.
17x8' Sidney, Hy. Duty,Q.C.G.,c.
18x8' Chard, semi-q. c. g., cone
18x8 Mueller, Q.C.G. cone drive
18"x8' Mueller Pl. Turning, Heavy Duty
18"x8' Cisco, Q.C.G. cone drive
18x8' Hamilton, QCG, cone dr.; taper
18x12' Prentice, Pl. Ch., Taper
18x12' Hamilton, Pl. Change Chuck cone
19"x8' LeBlond Hvy. Duty Prod.
20x10' Davis, Pl. Change; c. d.
21x8' LeBlond Heavy Duty with Turret
24x12' Crawf.-Eric, QCG,cone(2)
24x16' L & S Taper; QCG, M.D.
26"x8' Bridgeford Q.C.G. cone d.
26x16' Greaves-Klusman Pl. Ch.
42x20' Gleason Plain Change; cone. Internal geared face plate; 11'6" centers

ROLLS:
84"x8" Pinch Type
84"x4" Rolls; slip type
48"x3¼" Rolls; slip type
36"x3" Rolls; slip type

PIPE MACHINES:
2" Jarecki
2" Landis
4" Curtis
6" Jarecki
12" Saunders

BROACHING MACHINES:
No. 4 La Pointe of Hudson
No. 3 LaPointe of Hudson

PAPER CUTTERS:
42" Acme, Power Clamp
24", 30", 54" Jacques Hand

GEAR CUTTING MACHINERY:
Adams No. 1 Hobber; 12" (2)
Whiton Spur Gr. Cutter No. 2
Whiton Automatic Univ. Cutter No. 2
Schuchart & Schutte 18" Hobber
Barber-Colman No. 12; M.D.,(3)
Barber-Colman No. 3 with Power Feed M. D.
Barber-Col. No. 3 standard; b.d.
G&E 48" Cutter, fine condition

RIVETERS & HAMMERS:
No. 2 Marquette Riveting Press, back grd., M.D.,Air Cus.
No. 80 Grant Rivet Spinner
No. 0 Grant Bench Type Rivet Spinner
No. 1A Rochester High Sped
No. 1B Rochester High Speed
No. 2A, No 3A, No. 3AHD, No. 4AHD, No. 5½B, No. 6B Rochester High Speed Hammers
No. 1 Campbell Nibber 3/16" throat
15 lb. Bradley Upright
50 lb. Little Giant Upright
400 lb. Peck Drop Hammer with Auto Lifter
200 lb. Bliss Board Drop, poppet base (new)

AIR COMPRESSORS:
6x6 Bury, horizontal
6x6 Curtis Vert., twin
7½x6 Ing. Rand, type REI
9x8 Blaisdell-Bradford
10x10 Chicago, Pneumatic
12x10 Ingersoll Rand
10x8x7½ American "Fairhurst" High Pressure
14x14x8 American "Fairhurst" 500 CFM

ENGRAVER:
No. 3 Zeiss, Flat & Tubular Work; belt drive

SAWS:
Cochrane-Bly No. 1B, 2B, 4B Cold Saws
Laidlaw Metal Cutting Band Saw, M. D.
Racine 10x10, belt drive, 6x6 (3)
Peerless 6x6 belt dr.; cab base
Toledo 6x6 M. D. new High Speed Hack Saw
Wallace direct connected M. D. 18" Band Saw
No. 11 C&B Saw Grinders (3)
30", 36" American & Sidney Band Saws
No. 4 American Band Resaw

PRESSES:
No. 5 American, S.S. Geared
No. 37½ Bliss, S.S. Geared
No. 37½ Bliss Plain Flywheel
No. 14 Toledo Horn
No. 25 Niagara Arch
No. 30 Bliss Arch
No. 21½ Bliss OBI, Grd. (3)
No. 21½ Bliss OBI Plain, M.D.
No. 21 Bliss OBI, Plain
No. 20B Bliss OBI, Plain
No. 20 Bliss OBI, Plain (10)
No. 19C Bliss OBI, Plain (2)
No. 19 Bliss OBI, Plain (2)
No. 18 Bliss OBI, Plain (2)
No. 2½ V&O Plain Press, OBI
No. 3 Amer. Can Co., Pl. OBI
No. 36 Niagara Back Flywheel
No. 46 Perkins Grd., Back flywh.
No. 16 Bliss Horn, M. D.
No. 14 Stoll, Geared
No. 3R Marquette, Grd. M. D.
No. 1 Bliss Toggle
6-ton General Flexible
12-ton General Flexible
No. 5 Greenerd Broaching
No. 4 Adriance, OBI, Plain
No. 75 Toledo OBI, Geared
No. 6 Waterbury-Farrel, OBI, Pl.
No. 61 Reducing Press, Bliss
25-ton Henry & Wright

FLATTENING ROLLS:
12x22" Farrel
6x12" Farrel, wobbler type

Partial Listing Only. Send Us Your Inquiries.

FALK MACHINERY COMPANY 18 WARD STREET ROCHESTER, N.Y.

Lathes: 27"x16' American 8-speed head: Lehman 20"x14' Q.C.G.: Davis 12"x6' Q.C.G. Tool Room T.A.
Milling Machines: No. 2 B & S Universal with full Universal equipment: No. 2B B & S Plain: No. 1 B & S Universal No. 3 Conradson-Ryerson Hy-power pl.: No. 12 P. & W. 2 spindle profiler: 12" Cinc. Mfg. type dove-tail Mill. att.
Turret Lathes: W & S No. 6 Semi-Universal: No. 6 Plain: No. 2 Plain: Millholland Plain 1¾" cap. bar feed
Radial Drills: 3' AMERICAN TRIPLE PURPOSE MOTOR ON ARM: 5' Bickford, Universal S.P.D.: 3' Canedy-Otto motor on spindle
Boring Mills: Giddings & Lewis Horizontal 4" bar floor type S.P.D.; Niles 30" Vertical turret head C.D.: No. 0 Giddings & Lewis (like new)
Presses: Booth straight-side 24x36 bed, geared: No. 0 Bliss Consolidated Bench type Presses
Brakes: Chicago Steel Apron 10' 14 ga hd.
Planers: 22x22x6' Pond: 38x42x10' Gray: 32x36x10' White.
Ironworkers: Pels Universal 6x6x⅝ angles —punch 1" thru 1"—Pels combination shear—Pels Bar Shear

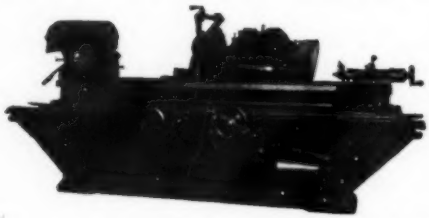
ACME EQUIPMENT CO.
128 S. Clinton St., :-: Chicago, Ill.

Turret Lathes, J. & L. 3x36"
Turret Lathe, Greenlee 2-¼x26, flat turret
W. & S. No. 2-A ser. over 200,000
Lathe, L. & S. 30"x16', qk. chg.
Lathe, Hendy 20x10' qk. chg. tap. at.
Lathe, Hendy 14x6 geared head
Lathe, Hendy 14"x6' taper attach.
Lathe, LeBlond 17" gd. h., pro., M.D.
Grinder, Brown & Sharpe No. 1 univ.
Grinder, Brown & Sharpe No. 4 univ.
Grinder, Landis 10x24 Pl. Cyl. ser. over 14,000 M.D.
Modern 12"x48" pl. cyl. Gdr. self-c.
Planer, Cleveland, opens., 30x30x12
Shaper, G. & Eb. 16", bk. grd., m.d.
Tinius-Olsen Static-Dynamic Testing & Balancing Machine
Miller, Hendey No. 1½ Univ., vert. h.
Miller, Brown & Sharpe No. 1-D Univ., complete cone-drive
Press, Robinson No. 40-B, dbl. crank

Over 500 Machines in Stock
We Solicit Your Inquiries

F. W. BURNS MACHINERY CO.
1441 NORTH THIRD STREET, MILWAUKEE WIS.

HILL-CLARKE
MOTOR DRIVEN GRINDERS



6"x32"	10"x72"	16"x72"
10"x18"	14"x36"	16"x120"
10"x24"	14"x50"	18"-24"x96"
10"x36"	14"x72"	18"x96"
10"x50"	16"x50"	21"x96"

HILL-CLARKE MACHINERY CO.
645 WASHINGTON BLVD. CHICAGO

REBUILT & GUARANTEED MACHINES

BORING MILLS:
3" Fitchburg Knee Type Horizontal
4-¾" Niles Knee Type Horizontal

BORING MILLS—vertical:
44" Baush P. R. T., M. D.
42" NBP Standard, M.D.
42" Colburn Heavy Duty, M.D.

ENGINE LATHES:
36"x27' Pond Two Carriages
36"x27' Gleason
20"x14' Cisco, Geared Head
20"x14' Walcott, Geared Head
18"x 8' American, Geared Head
10"x 5' P. & W. Prod. Lathes

GEAR CUTTERS:
36" Gould & Eberhardt, M.D.
60" Gould & Eberhardt, M.D.
72" Gould & Eberhardt, M.D., (2)
No. 12 Barber-Colman Hobbers
Fellows Gear Shapers, Nos. 3, 6, 62

MILLERS:
No. C Becker Vertical M.D.
No. C-2 Becker Vertical M. D.
No. 2V P. & J. Automatic Vertical
No. 24 Brown & Sharpe Plain
No. 6 Becker Vertical
28" Cincinnati, Semi-Automatic
24" Cincinnati Duplex
No. 2 Cinc. Vertical M.D.
No. 3 Cinc. Vertical M.D.
37"x37"x14' Ingersoll Horiz. Slab
Carter & Hakes Lincoln Type
G. & E. Lincoln Type
Owen Duplex
P. & H. Vertical Key Seat
60" Garvin Automatic Duplex

PLANERS:
72" Morton Portable M.D.
42"x42"x13' Pond H.D., Rev. M.D.(2)
42"x42"x12' Cincinnati Rev. M.D. (2)
42"x42"x16' Pond Motor Drive
30"x30"x12' Whitc. Hvy. Duty M.D.
30"x30"x10' Niles 3-Heads

MISCELLANEOUS:
20"x96" Landis Grinder
24"x96" Landis Grinder
30"x240" Landis Grinder
84" Diamond Face Grinder H. D.
48" Morton Keyway Cutter M. D.
8" Stoever Pipe Threader
No. 2 Lapointe Dbl. Spindle Broach
500 ton NBP dbl. Carwheel Press

Special: 2-9" Spindle Ingersoll Facing and Slotting Millers, M.D.

Tolerances and accuracy of our rebuilt machines unconditionally guaranteed.

NOTE:—We solicit rebuilding and motorization of your own machines.

ATLANTIC MACHINERY CORPORATION

149 Broadway, New York City **Telephone: WOrth 2-0662** **Cable: Atmacor**

No. 2M Cincinnati Universal Miller, S.P.D.
No. 1 Brown & Sharpe Univ. Miller, cone
No. 1½ Rockford Universal Miller, cone
No. 10 Van Norman Universal Miller
No. 2A Becker Vertical Miller, Motor Driv.
Type B Briggs, Production Millers
Model B Becker Vertical Millers
6"x48" Pratt & Whitney Thread Millers
6"x14" Pratt & Whitney Thread Millers
⅝"x3-¾" New Britain 6-spindle, Motor Drive, Auto. Screw Machines
No. 33 New Britain Chucker
24"x12' Hendey, Lathe, Cone
18"x6' Hendey Lathe, Cone
16'x6' Reed-Prentice, Geared Head Lathe
No. 12 Barber-Colman Hobber
10"x24" Landis Plain Grinder
No. 12 Pratt & Whitney Profiler
Garvin Die Slotter
Fairbanks Hammer

PARTIAL LIST ONLY—SEND US YOUR INQUIRIES:

DALEY & SIBLEY

MACHINERY DEALERS INCORPORATED

419 Chapel Street **New Haven, Conn.**

— PARTIAL LIST —

36"x36"x10' Cincinnati Planer 4 heads, M. D,
12x52" Landis plain Grinders.
2¼"x26" Greenlee Flat turret lathe, cone.
No. 12 and No, 13 Natco Drills.
Avey 4 spindle, drill, No. 2 m. t.
Avey 6 spindle, drill, No. 2 m. t.
Single spindle Leland Gifford, B.B. drill.
No. 1B & No. 2B Edlund two spindle, B.B. drills.
No. 818 Dreis & Krump Hand Brake.
16" x 48" Landis Crankshaft grinders.
20" Kelly Shaper, B.G. Cone.
10' Robinson Toggle press brake.
3 Spindle Kern. B.B., drill with tapping heads.
24"x24"x6' Cincinnati planer, 1 head.
20"x10' Monarch lathe, q.c.g., cone.
No. 2X Garvin Tapping Machines.

IROQUOIS MACHINERY CO., 660 Ohio St., Buffalo, N. Y.

IN STOCK — FOR IMMEDIATE DELIVERY

AUTOMATICS
¾" Gridley, Model F
1¼" Gridley, Model F (3)
BAND SAWS, Metal
No. 1 Kiem; 10"x10" Napier
BORING MILLS
No. 0 Gidd.; Lewis Hz. M.D.
42" Niles Vert. Gr. Box, S.P.D.
DRILL PRESSES
Avey Bch. Type H.S.B.B. (10)
21" Buffalo, M.D.
20" Champion, B.G.
No. 11 P. & W. Multiple (2)
4 Spindle Leland-Gifford, M.D.
4 Spindle Barnes Camel-Back, All Geared, self oiling
No. 23 Foote-Burt High Duty
GRINDERS
No. 27 Gardner M.D. opposed disc
Disc, Nos. 4 & 6 Gardner, B. B.; 26" Badger B.B.
HACK SAWS
Nos. 1 & 2 Marvel, S.P.D.
No. 3 & 7 Atkins, S.P.D.
6"x6" Peerless
8"x8" Racine, M.D.
LATHES
14"x6' Bradford, Q.C.G.
16"x6' American, Q.C.G.
16"x8' Bradford Grd. Hd.,M.D.
16"x8' South Bend
18"x10' Lodge & Shipley Grd. Hd., M.D.
18"x10' Bradf. Grd. Hd.M.D.
18"x12' LeBlond
26" Pryibil B.B. Spinning
26"x16' Bridgeford
27"x16' Lodge & Shipley, M.D.
42"x20' Wickes Grd. Hd.M.D.
MILLING MACHINES
No. 2 Kempsmith, Plain
No. 2½ LeBlond, Plain
No. 3 Kempsmith Universal
Chicago Hand Mills with Vert. Hd.
Melling Mill-Matic, M.D.
12" Cinc. Mfg. Mill M.D.
No. 2 Standard K & T Universal motor in base
No. 3B K & T. Pl. Motor Dr.
No. 33 Kempsmith M.D.
GEAR SHAPERS
24" Fellows (2)
NIBBLERS
No. 1 Campbell
No. 1 Gray
PLANERS
26"x26"x6' Niles
42"x36"x12' N.B.P. with side head
PUNCH PRESSES
Cam Drawing, No. 1 Bliss, b-g.
No. 3½ Bliss Toggle
No. 20 Excelsior, deep throat
No. 248 Cameron Strip Feed
RADIAL DRILLS
3' American Sensitive
4½' American Sensitive, M.D.
3½ Am. Triple Purpose, M.D.
4' Ryerson, S.P.D.
BENDING ROLLS
4' Rock River, M.D.
6' Rock River, M.D.
SHAPERS
3½" Rhodes Slotter
14" S. & M. M.D.
20" G. & E. M.D.
24" Steptoe, S.P.D.
24" Stockbridge, M.D.
28" American S.P.D.
TURRET LATHES
No. 2A W. & S. S.P.D. (2)
21" Gish, 3½" hole 2 step cn.
WELDERS
Arc: 200 Amperes USL
Butt: 10 KW Thompson
Spot Welder 9 KW, AEF
MISCELLANEOUS
Acme Steel Banding Machine, Portable, M.D.
No. 054 Unishear, M.D.
4" Hurlbut-Rogers Cutoff.
150 Ton Hydraulic Whl. Pr.
No. 5 Greenerd Pwr. Arb Pr.
No. 5 Thiel Fil. Mch., M.D.
No. 1 Davis Keyseater
2—Meaker Lead Lined Variable Speed Tanks
No. 80 Grant Spinners
250 lb. Trip Hammer

VICTOR MACHINERY CO., **130-132 S. Clinton St. Chicago, Illinois**

TOOLS NOW ON HAND

AIR COMPRESSORS

67' Chicago Pneumatic, NSB.
136' Chicago Pneumatic, NSB.
136' Ingersoll Rand, ERI.
166' Ingersoll Rand, ESI.
355' Ingersoll Rand, BRI.
357' Bury
369' Chicago Pneumatic, NSB.
550', National 3-cyl.
620' Sullivan WJ3
676' Ingersoll Rand, XRE2
706' Sullivan, WJ3
868' Chicago Pneumatic, OCB.

DRILLS

21" & 24" Cincinnati
30" Snyder
No. 15 Fox 6 spdl. hyd.
Nos. 6D, 11D & 16D Moline
No. 12 Natco 8 & 12 spdl.
No. 14 Natco 12 spdl.
No. 22 Natco 16 spdl.
No. 30 Natco 34 & 48 spdl.
4"x36" Sundstrand horiz.
3' Cincinnati radial
3½', 4' & 5' Western radial
4' Carlton Sensitive
5' American motor-on-arm
6' N-B-P univ. radial
Nos. 121, 216, 217, 314, 315, 416 Baker
10D Moline cylinder borer
Nos. 17 & 25 Foote Burt
No. 2 Colb., 1, 2, 3 & 4 spdl.
All sizes and makes Sensitive

FURNACES

Stewart triple combination
No. 420 Standard Fuel Engineering Co.
No. 0 Stewart crucible
21"x32"x21" Surface Combustion Co.
45"x46"x45" heating for forge work
No. 515 Standard Fuel Engineering Co.

GEAR CUTTERS

Nos. 1 & 5A Lees Bradner
24" Gleason gear planer
26" & 48" B. & S. auto. spur
36"x6" G. & E. auto. spur
Lipe 2 spindle Chamferer
15" Gleason quencher
12HS&18H G & E hobbers
Nos. 3 & 12 Barber Colman
Bilton gear miller

ENGINE LATHES

14"x6' Walcott
14"x8' Lodge Shipley
16"x6' Lodge & Shipley
16"x8' Reed Prentice grd. hd.
16"x6' Monarch, geared hd., motor in base
16"x8' Hendey grd. hd.
16"x6' Cincinnati
18"x10'6 Rahn Mayer Carpenter
20"x10 Hendey grd. hd.
20"x10' Davis
22"x12' Morris, grd. hd., m.d.
24"x10' Schumacher & Boye
24"x10' LeBlond
24"x12' Lodge & Shipley
24"x16' Schumacher Boye
36"x22' Schumacher & Boye

TURRET LATHES

No. 2 SP Garvin
Nos. 4, 7 & 9 Foster
No. 4 Bardens & Oliver
No. 4 Cincinnati
No. 6 Warner & Swasey
2½" & 3" Jones & Lamson
21" Gisholt
Nos. 5A & 6A P. & J.
24" Bullard

BORING MILLS

4" Landis floor
36" Niles, car wheel
42" Bullard
52" Gisholt
60" Colburn

MILLERS

No. 1 Cincinnati, plain
Nos. 2 & 2B Rockford, univ.
No. 4 Cincinnati, univ.
Model C Becker, rotary 29¾"
No. 13B Brown & Sharpe, mfg.
Type AB Becker, vert.
36" Ingersoll rotary
48" Ohio tilted offset
48" Newton rotary
28", 37" & 42" Briggs
No. 1 Davis & Thompson
Type 45 Bilton Productomatic
No. 2 Bilton gear
Kent Owens (Toledo)
2M Potter & Johnston, auto.
Ingersoll hyd. planer type

PRESSES

750 ton Baldwin Southwark triple act. hyd. toggle draw. 142½" bet. uprs., 84" shut height, 550,000 lbs.
500 ton No. 664B Toledo coing. 40" between uprights
150 ton No. 661 Tol. coin.3"str.
150 ton Elmes hyd.
100 ton French Oil Mchy. Co., hyd. press for strhtng. casts.
108" No. 796¼D Toledo Double Crank Toggle Drawing
No. 30E Cleveland S.S.
28" No. 71 Swaine dble. crk.
No. 21½ Bliss consd. OBI
Waterb. F. OBI 4½" shaft
Nos. 75&76 grd. Toledo gap
Fremont gap, 75 tons
Wat. Farrell gap, 40 tons
No. P2 Ferracute
No. EG35 Erie punching
No. 94 Bliss Consd. Punch.
Nos. 55, 55½, and 56 Tol. str.
No. 65 Consd., straight side
No. 7 Rockford, straight side
No. 8-7 ZEH & Hn., strt. side
No. 74½ Bliss, straight side
No. 4 Massillon, str. side, grd.
No. 180 Toledo
No. 78 Toledo
Nos. 13 & 14 Toledo
80 ton Jarecki, screw

SAWS

4", 5", 7" & 8" Higley cold saws
6" Nutter & Barnes cold
6"x6" Peerless univ.
6"x6", 8"x8" & 12"x12" Racine hack saws
6"x6" Atkins
8"x18" Robertson
Reed Prentice band sawing & filing machine
2¼" Racine abrasive

SHAPERS

16", 20" & 24" Walcott
16" Kelly
20" Smith & Mills
24" Milwaukee
24" Columbia
24" Cincinnati shaper planer
24" Gould & Eberhardt
28" Ohio
36" & 48" Morton draw cut

WELDERS

12, 18 & 150 KVA AEF spot
17 & 100 KVA Thompson Gibb spot
20 KVA Agnew spot
20 KW Federal spot
23 KVA Winfield spot
25 KW Winfield butt
35, 65 & 75 KW Federal butt

MISCELLANEOUS

No. 3 Oilgear hyd. broach
Nos. 3, 5 & 29 W. & W. bulldozer
No. 45 Heald Borematic
17"x36"—48" Norton crank grinders
Nos. 2, 3 & 4 Mitts & Merrill Keyseaters
3/16" Gray sheet metal cutter
Nos. 1, 2, 2X & 2 BG Garvin tappers
No. 20 Wickes blue printer
3½" Hanson Whitney centerer
Blakeslee degreaser
AC die caster
3000 Amp Jantz & Leist MG set
5" bar Barrett cyl. borer
Rowbottom cam miller

If you have not received your list No. 172, "Plenty of Tools" write for it.

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MILES MACHINERY CO., SAGINAW, MICH.

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Price $1.00 Each In Any Size

New Low Prices. — Increase Production — Cut Operating Costs

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials (such as hard rubber, bakelite, fibre), and tough alloy steels up to 500 Brinell hardness.

Left—100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½

Right—200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below—300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½

STANDARD TUNGSTEN CARBIDE TIPPED TOOL BITS

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lot of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

We Carry Silicon Carbide Emery Wheels for Grinding Tungsten Carbide Tool Bits

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1½ KT. FOR USE ON 24" DIA. WHEELS OR SMALLER
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TURRET LATHES AND SCREW MACHINES

No. 31 Gisholt, m.d., 4½" hole, chucking
26" Libby Type C, m.d., 7½" hole, chuck.
18" Libby Type A, m.d., 4½" hole, chuck.
Dreses Brass Lathe, cone
No. 0 Brown & Sharpe Hand Screw Mach.
No. 2 Pratt & Whitney Turret, cone
No. 4 Woods Tilted Turret, cone
2 spindle Jones & Lamson Steel Head Flat Turret, m.d.
2x24" Jones & Lamson, bar, m.d.
3x36" Jones & Lamson Geared Head, chk.
3x36" Jones & Lamson Geared Head, bar
2 spindle 3x36" Jones & Lamson, chk., m.d.
16" Warner & Swasey, cone
21", 24" Gisholt, cone

GEAR CUTTERS AND HOBBERS

6", 18" Gleason Straight Bevel
16" Cincinnati Gear Hobber, m.d.
16" Gould & Eberhardt Gear Cutter, belt
No. 1 Lees-Bradner Gear Hobber, m.d.
No. 3-26" Brown & Sharpe Gear Cutter
No. 3 Heavy Brown & Sharpe Gear Cutter, s.p.d.
No. 3-26" Cincinnati Gear Cutter
No. 5A Lees-Bradner Gear Generator
No. 6-60" Brown & Sharpe Gear Cut., m.d.
No. 6-72" Brown & Sharpe Gear Cut., m.d.
No. 12 Barber-Colman Gear Hobbers
Gleason Spiral Bevel Gear Rougher
Gleason Bevel Gear Tester
Schuchardt & Schutte Gear Tooth Rounder
Rochester Gear Tooth Rounder
D. E. Whiton 28" Universal Spur & Bevel Gear Cutter

PIPE MACHINES

12" Landis, m.d.
8" Landis, m.d.
No. 2 Bignall & Keeler, m.d.
2" Jarecki, m.d.
2" Landis Double Head Pipe & Nipple, cone
2" Merrell, m.d.
2" Saunders, m.d.
4" Eaton, Cole & Burham, belt
No. 4 Bignall & Keeler, m.d.
8" Bignall & Keeler, belt

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1500 lb. Niles Steam
350 lb. Niles Steam (new)
550 lb. Bement-Miles Steam
650 lb. American Eng. Steam
2000 lb. Erie Double Frame Steam Forging
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60 lb. Bradley Rubber Cushioned Helve
100 lb. Bates, m.d.
100 lb. Little Giant, belt
200 lb. Bradley Upright Strap
250 lb. Little Giant

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⅜-½" Cleveland Model B
4 spindle ⅞" Cleveland Model M
⅞" Cleveland Model A
1¼" Cleveland Model A
1½-½" Cleveland Model B
2" Cleveland Model A
No. 5A, 6A, 6D Potter & Johnstons
No. 23, 24 New Britain Automatics

BORING MILLS

30" Bullard, cone
48" Niles Car Wheel Borer, cone
42" Gisholt, gear box
51" Baush, 2 heads, m.d.
7' Niles, cone, 2 heads
7-10' Niles, m.d., geared feeds, 2 heads
No. 2 Barrett Cylinder Borer
No. 4 Niles-Bement-Pond Horizontal, 5½" bar
Niles-Bement-Pond Cyl. Borer, 12" main bar, m.d.

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16" Davis Plain, gear box, m.d.
20" Hendey Friction Type, belt
20" Steptoe, cone
24" Barker, cone
24" Cincinnati, cone
24" Gould & Eberhardt, gear box
24" Gould & Eberhardt, cone
24" Rockford, cone
24" Rockford, gear box
36" Cincinnati, gear box, p.r.t.

GRINDERS

6x32" Norton, m. d.
No. 14 Brown & Sharpe, belt
10x24" Landis, m. d.
10x36" Norton, m. d.
10x50" Norton, m. d.
10x52" Landis, m. d.
12x18" Cincinnati Plunge Cut, m. d.
12x36" Cincinnati, belt
12x36" Cincinnati, m. d.
12x36" Modern, m. d.
12x42" Landis, belt
12x48" Modern Universal, belt
12x72" Cincinnati, m.d., hydraulic feeds
12x48" Modern, m.d.
No. 50, 55, 60, 65 Heald Cylinder
No. 6 Bryant Inernal, belt
No. 12A Bryant Internal, m. d.
No. 70 Heald Internal, belt
No. 1 Cincinnati Tool & Cutter
No. 2 Oesterlein Tool & Cutter
No. 4, 5 Oliver m.d. Drill Pointers
No. 23 Brown & Sharpe Gear Cutter Gdr.
Gisholt Universal Tool Grinder
Gleason Cutter Grinder, belt
Gould & Eberhardt Gear Cutter Gdr., belt
Yankee Drill Grinder, belt
No. 1, 6 Gardner Disc, motor
No. 51 Besly Disc, m. d.
No. 20 Gardner Combination, m. d.
No. 4, 120 Gardner Disc, belt

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24" Cincinnati Crank, m. d.
28"x28"x8' American, 2 heads
28"x28"x8' G. A. Gray, 1 head
30"x30"x8' Gray, 2 heads
30"x30"x8' Gray, 1 head
30"x30"x8' Pond, 1 head
30"x30"x10' American, 1 head
30"x30"x10' Cincinnati, 2 heads
32"x32"x8' Gray, 1 head
34"x24"x8' Cincinnati, 1 head
36"x36"x10' Cincinnati, 2 heads
36"x36"x10' Whitcomb-Blaisdell, 2 heads
36"x36"x13' Niles-Bement-Pond, 1 rail, 1 side head
42"x42"x16' Rockford, 4 heads, m. d.
42"x42"x20' Ohio, 2 heads, m. d.
60"x48"x16' Niles- 3 heads

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No. 4 Cincinnati Universal, m.d., rect. overarm, National Standard Spindle
No. 4 Cincinnati Pl., m.d., rect. overarm, N. S. S.
No. 5G LeBlond Universal, m.d
No. 3 Cincinnati, Plain, cone
No 3H LeBlond Plain, cone
No. 13B Brown & Sharpe Plain, s. p. d.
No. 15 Garvin Plain, cone
No. 22 Garvin Vertical, s. p. d.
No. 2 Garvin Lincoln Type, belt
No. 7H Becker Lincoln Type
C17 Newton Vertical Slab Miller
C66A Newton 3 spindle Continuous
Gooley & Edlund Briggs Type
30"x28"x8' Ingersoll Planer Type
48" Oesterlein Tilted Offset, m. d.

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16"x6' Reed-Prentice
16"x8' Reed
18"x8' American, taper
18"x10' American, taper
18"x12' American, taper
18"x9' Lehmann
18"x15'Lehmann, taper
20"x14" Hendey, taper
24"x16' Axelson, m.d., taper
24"x14' Lodge & Shipley, m.d. taper, late type
24"x18' Lodge & Shipley, pat. hd., taper
26"x16' Bradford, taper
36"x22' LeBlond
60"x27'x6" Niles-Bement-Pond, m.d.
60"x30' 6" Niles-Bemend-Pond

CONE HEAD ENGINE LATHES

16"x6' Hendey Yoke Head, taper
16"x6' Springfield, taper, relieving
16"x8' Rockford
16"x10' Oliver
18"x8' American
18"x8' Cincinnati
18"x8' Mueller
18"x8' Springfield
18"x10' Springfield
18"x14' LeBlond, taper
19"x8' LeBlond, taper
19"x12' LeBlond, taper
20"x10' Lodge & Shipley
21"x8' LeBlond, taper
21"x10' LeBlond
21"x16' LeBlond
21"x12' Bradford
22"x13' Niles
24"x8' 6" Bridgeford
24"x10' Bridgeford
24"x10' Canada
24"x10' LeBlond
24"x11' Chard
24"x16' Schumacher-Boye
24-48"x16' McCabe 2 in 1
24"x26' American, taper
36"x10' Schumacher-Boye
42"x24' Springfield
26"x18' Schumacher-Boye

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2½' American, gear box
2½' Avey Sensitive
3' American Sensitive
3' Carlton Sensiti e
4' Hammond Jack Knife
4' Morris, gear box
4' Ryerson, gear box
5' American Triple Geared
5' Bickford, d.c. drive
4', 5', 6' N-B-P Semi-Universal
5' Prentice, cone
6' Fosdick, gear box
7' Dreses, gear box
7' Fosdick, cone
No.1 W. F. & John Barnes Horizontal

HEAVY DUTY DRILLS

20", 24" Barnes All Geared Self-Oiling
24' Barnes All Geared Self-Oiling, tapper
20", 22", 26", 28" W.F. & John Barnes
21", 22", 24", 32", 36" Aurora
21", 25" Weigel
32"x 36" Cincinnati Bickford
D2, D4, D6 Colburn H. D.
No. 2, 4, 22 Colburn Mfg.
No. 310, 314, 315 Baker H. D.
3 spindle 20" Barnes Gang
4 spindle No. 2 Colburn Mfg.
4 spindle No. 2 Foote-Burt
4 spindle No. 4 Foote-Burt
5 spindle 24" Barnes All Grd. Self-Oiling
6 spindle 21" Hoefer Gang
6 spindle Niles Gang
No. 7D Moline 2 spindle Hole Hog
No. 220 Baker 2 spindle

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48" x 48" x 16' Detrick & Harvey Heavy Duty Double Housing Planer, two heads on cross rail and two side heads, box table type, arranged for variable speed motor drive.

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42" Bullard Vert. Boring Mill, 2 swivel heads. Arr. M.D.
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No. 2 Cinn. Plain B.G. Mill
No. 21 Garvin Geared Mill, Plain
18"x8' So. Bend Lathe
16" Cinn. Shaper B.G., vise
No. 1-P Grob Die Filer, M.D.
24" Delta Die Saw, M.D.
No. 1 Waterbury-Farrell Auto. Screw Slotter, 5/16" capacity, M.D.
48" McKay Roller Leveler, 3/16" cap.
2-⅞" Binsee Horz. Boring Mill
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42" Bliss Gang Slitter, 20-Ga. M.D.

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WESTERN 6' and 7' PLAIN RADIAL DRILLS
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G. & E. 24". 32" SHAPERS, M.D
BLISS No. 4 TOGGLE PRESS—tie rod
WAGNER HYDRAULIC COLD SAW—cap. 7" round
HILLES & JONES No. 3 BENDING ROLL
GISHOLT, 34" TURRET LATHE, 7½" HOLE IN SPINDLE

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410 BROOME STREET, NEW YORK, NEW YORK

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Cleveland, Models A, C, 1¼", 2"
National Acme 3" Model B, m.d.
Nos. 24 & 34 New Brit. Auto. Chucking, m.d.

Drills
2, 3, 4 spdl. H.&W., Allen Lel-Giff., Avey (33)
Pratt & Whitney dble. end., m.d. & m.
Moline Hole Hog, various sizes (5)
Fox Mult. Spdle. with tapp. att. (4)
No. 121 2-spdle. Baker Gang Type, mult. sp. heads, rot. tables, m.d. & m. (3)
21" Cinci., Prod., box column, g.m.d. & m. (3)
5' Western Radial, m.d. & m.
3-spdle. Colburn, m.d. & m.

Gear Equipment
No. 36 ST G. & E. Auto., 4 spdl. Gr. Rgh.,m.d.
No. 5A Lees Bradner Gear Hobbers, (3)

Grinders
No. 15A Bryant Chucking, Int. and Face
No. 55 Heald Internal
No. 60 Heald Internal, c/s
20"Badger Face, hyd. feeds, table travel 44"
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No. 6 Besley Dble. Disc
No. 132 Arter Drum Type, m.d. (2)
Norton Model B Tur. type, m.d. (2)
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54" Ingersoll Rotary, 3 head, m.d.
66" Newton Rotary, m.d.
No. 1 Kempsmith Universal (2)
No. 4 Brown & Sharpe, cone drive
No. 1½ Cincinnati Plain, c/s.
84" Sellers Vert. Boring

Planers
36"x60"x14' American, wid. to 60", rl. insd. hd.
42"x42"x12' Bedford Openside, m.d. & m.
36"x36"x8' Pond Planer, one rail, one side hd.
30"x30"x6' Pond Planer, 2 rail heads

Presses
73½ Bliss Press (2)
74½ Bliss, tie rod cons., m.d. & m.
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251½ Cleveland Dble. Cr., gap frame, m.d.&m.
No. 30G32 Cleveland D.C., m.d. & m.
No. 55½ Toledo Tie Rod, with dble. roll fds.
No. 52 Toledo Arch, 29x29 bolster
No. 63 Michigan, S.S.
Canco, No. 5, 8' stroke, S.S., B.G., m.d. & m.
Nos. P2-P4 Ferracute, m.d.
DG-53 Ferr. S.S., S.C., B.G., G.M.D.
No. 6C Rockford dble. cr., s.s.

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1" National, Steel Bed
1½" Acme, steel bed, m.d.

No. 407 Bliss Double Crank Toggle Press, m.d. & mtr.
No. 410 Bliss Double Crank Toggle Press, m.d. & mtr.
36" x 36" x 16' Cleveland Openside Planer, m.d. & mtr.
250,000 volt General Electric X-Ray Machine, lead lined, will X-ray boiler plate up to 2" thick, overall dimensions, length 102", width 84", height 88"

No. 126 Gardner dbl. spdl. op. m.d. type, h.f.
Nos. 6, 12A & 20 Bryant (12)
12" and 16" x 36" Cinc Pl Cyl., (2)
No. 2 Norton Tool & Cutter, c/s

Lathes
20"x8' Gisholt Turret, (4)
16"x8' Bradford Grd. Hd.
24"x16' Prentice, geared head, taper att., sgle. pulley dr.
Nos. 5A & 6A Potter & Johnson Auto., m.d.
Lo-Swing, 60" bet. cent. 12" swing
18"x7' American, grd. hd.
16"x6' Hendey, Q.C.G., m.d.
32"x14' Hendey quick change, m.d. & m.
18" Cinc. Acme, b.g. (3)
28"x10' Chard, heavy duty, t.a.
3x36 J & L Flat Turret, s.p.d.
14"x5' Walcott
21¼"Jones & Lamson Screw Mch.
16"x12' Lodge & Shipley, q.c.g, t.a.
60"x10' New Haven, back geared

Mills
No. 2 Cincinnati Universal, c/s
Nos. 1, 2 & 3 Craftsman Prod., Rotary

Welders
Federal, 150 KW, motor drive
Taylor Win., Nat'l, Fed'l, m.d. Butt (12)
Taylor Winfield 4-way flash welder
Taylor-Win., Fed., Thomson Spot

Miscellaneous
Balancer, 18" Gisholt Static, arr. m.d. with 4-speed head (2)
Broach, V-18 American
Bulldozers, Nos. 3 and 5 Williams & White
Core Blower, No. 6 Demmler (3)
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Polishers, U.S. Elec. Tool, m.d. in base, 4-brg., h.d. type (16)
Punch, Long & Alstatter, 40" throat
Rivet Heaters, Berwick (4)
Shaper, 18" American Hydraulic
Thread Roller, No. 10 Waterbury Farrell
Trucks, El. Parker Elec. Mule; 3-ton Auto. Low-Lift.
Threader, Rickert & Schaeffer Horiz. with auto. index

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D-31 Fox multiple drill, rectangular head, 16"x31½" spindle centers. No. 2 Morse taper; 10 spindles, hand and power feed to head.

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BOLT CUTTERS, 2" Landis.

DIES and MACHINES for rect. cans, inc. 61 Ams flanger; 72 Ams double seamer; 126CD Adriance double seamer; 281 Adriance gang slitter; No. 114 Adriance Automatic Double Seamer 10" round cans.

DRILLS, 36" Cincinnati, back geared sliding head, tapping attachment; 4 ft. Dreses plain radial gear box drive; No. 4 Quint six spindle turret drill; No. 4 Morse tapers; 2 sp. Leland Gifford Ball Bearing left H. sp. with tapper

ENGINE LATHES, 22"x10' Davis dble. back gear quick change; 38"x14' Fifield 14" 8' Monarch, plain change; Four 9"x20" Porter Cable Production lathes with back facing attachment.

MILLING MACHINES, No. 3½ Pratt & Whitney duplex, 60" table, 27" extreme between spindles; No. 1 Newton slab, 65" table feed.

TURRET & MONITOR LATHES, two 21" Gisholt turret lathes, 3½" bore in spindler; two 3"x36" Jones & Lamson; 16" Dreses, Fox Monitor chasing bar; No. 1 Am. Tool & Mach., Fox Monitor chasing bar.

PLANERS, 24"x6' Pond, one head; 36"x15' Betts two heads.

PIPE MACHINES, 3" Bignall & Keeler; 4" Saunders; both belt drive.

PRESS, No. 1 Bliss Cam Drawing Press —geared arranged for motor drive; EG. 52 Ferracute Embossing 150 ton 1½" stroke

SLITTER, Model G-36 Yoder gang slitter, motor drive with straightening rolls; 6 sets cutters.

SAND BLAST, C-36 New Haven 36"x44" Radial Sand Blast Barrel M.D.

SEPARATOR, 3 McKenzie chip production.

THREADING MACHINE, H & G Threading

WELDERS, two Gibbs spot welders, 18" throat 12 KVA.

Many other tools—exceptional "buys"—write for full details.

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Established 1894

MODERN MACHINES—ATTRACTIVE PRICES

MILLING MACHINES

No. 3 Davis Thompson Rotary Mill; M.D.

LATHES

18"x8' Reed; Motor Drive
36"-60" Harrington Sliding Bed Gap Lathe; length of bed, closed 16'; open 23'; B.D.
24"x12' Hamilton; B.D.

TURRET LATHES

24" Gisholt; 6¼" spindle; M.D.
3"x36" Jones & Lamson Double Spdle.; M.D.

GRINDERS

24"x240" centers Norton Type "A" Plain; M.D.
No. 14 Brown & Sharpe Pl. Cyl.; 10"x30"
No. 24 Gardner Horiz. B.B. Disc; 53" dia.
No. 14 Gardner B.B. Disc; 20" dia

RADIAL DRILLS & DRILL PRESSES

4' American Universal; S.P.D. thru gear box
2½' American Plain; S.P.D. thru gear box
8-spindle Natco Multiple Spindle Drill Press
6-spindle National Acme Horiz. Drill
No. 2B Edlund 4-spindle B.B. Drill; M.D.
3-spindle Sipp Drill; Motor Drive
4-spindle Hy Speed B.B. Drill
Leland Gifford Single Spindle B.B. Drill
Avey Single Spindle B.B. Drill; M.D.

GEAR MACHINERY

No. 612 Fellows Gear Shaper
72" Ruesch Gear Cutter

MISCELLANEOUS

CENTERING MACHINE, Hendey; Motor Dr.
HAMMER, 300-lb. Bradley Helve; M.D.
PIPE MACHINES, 2" and 6" Jarecki
RIVETER, Hyd., 150-ton Chamb., 6" stroke
PLANER, 18' Hilles & Jones Plate; ¾" cap.
SAW, 6"x6" Racine; S.P.D.
SHEAR, Hilles & Jones Throatless Geared Slit; 12" blades, ⅜" plates; ½"x4" flats
SHEAR, Lennox Bevel, ¾" capacity

SUN MACHINERY COMPANY, INC.

36 VAN VECHTEN STREET, NEWARK, N. J.

HIGH GRADE TOOLS

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15″x8′ Cisco, Cone Drive, Quick Chg.
18″x8′ Greaves Klusman Geared Head, Quick Change.
20″x10′ Hendey Cone Q.C.
20″x10′ Bradford, Cone Drive, Quick Change.
24″x10′ Bradford, Cone Drive, Quick Change.
21″x10′ LeBlond, 3 S.C.D. D. B. G.
26″x48″x22′ McCabe Double Spindle Lathe.
30″x14′ Lodge & Shipley, Cone dr., quick change.
30″x16′ Lodge & Shipley Cone Q.C.
36″x12′ Lodge & Shipley, Cone dr., Trip. Grd. Q.C.
36″ raised to 52″x24′ Johnson Trip. Grd. Lathe.
20″x8′ Lodge & Shipley Pat. Hd. Q.C.
14″x6′ Vernon, Cone drive, Q.C.
24″x10′ Greaves Klusman 3 S.C.D. D.B.G. Q.C.
24″x10′ American, 3 S.C.D. D.B.G. Q.C.

PLANERS AND SHAPERS

16, 20, 24″ G & E Shapers, cone dr.
16, 20, 24 and 28″ Gould & E. Shapers, S.P.D.
24″ Queen City H.D. Shaper, C. Dr.
24″ Hollingsworth H.D. Shaper, C. d.
20″ Cincinnati Shaper, Cone drive.
21″ Smith & Mills Shaper, Cone dr.
17″ Smith & Mills Shaper, Cone dr.
30″x30″x8′ Gray Planer, One head.
30″x30″x10′ Cincinnati Planer, B.D.
32″x32″x8′ Woodward & Powell Pl., B.D.

RADIAL & UPRIGHT DRILLS

2½′ Cincinnati Bickford Upright Radial Drill.
21″, 24″ Cinc. B. Upright Geared Fds.
24″ Barnes Upright Drill.

GEAR CUTTERS

No. 1, 2, 3 Adams Farwell Gear Hobs.

GRINDERS

Gardner 7½ H.P. Disc Grinder, Mechanical tables.
6″x18″ Ott Plain Grinder.
6″x18″ Landis Plain, Self Contained.
53″ Besly Ball Bearing Vert. Spindle Disc.
No. 55 Heald Internal Grinder.

MILLERS

No. 4 Cinc. Hi. P. Cone 3 S.C.D. D.B.G.
No. 4 Cinc. H.P. Cone Univ. 3 S.C.D. D.B.G.

BORING MILLS

No. 2 Niles Boring Mill, A.C. M.D.
84″ Pond Vertical Boring Mill.

TURRET LATHES

Pierce 1″ capacity Bar feed & mtrzd.
5A Potter & Johnson

MISCELLANEOUS

1½″ Hayden 4 spindle Automatic Screw Machine.
2½″ Landis Bolt Cutter.
No. 4 & 5 Mitts & Merrill Keyseats.
Model W Cleveland Pch. & Shr. 60″ thrt., M.D.
6′x3/16″ Chicago Bending Brake.
No. 92D Toledo D.C. Press.
No. 4A High Speed Riveter New.
2—No. 35 Niagara Presses New.
No. 36 Niagara Press New.
3-¾″ Hayden Five Spindle Automatic Screw Machines.
Quickwork Rotary Shear, M.D.
13″x13″ Peerless Saw.
8″ Atkins Saw.
6″x6″ Peerless Shaping Saw.
35 K. W. Federal Spot Welder.
3″ Landis Bolt Cutter, Cone drive.

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Over 150 Die Heads and Collapsible Taps. No Lists Available. We Suggest You Send Your Man To Select On The Spot. Priced Right.

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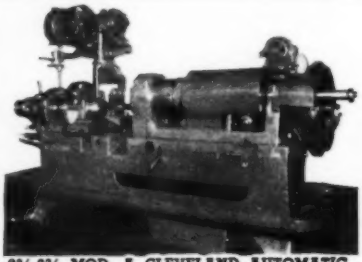

2¾-3¾ MOD. A CLEVELAND AUTOMATIC M.D. 30,000 SERIAL

No. 2½ ROCKFORD UNIV. MILLING MACHINE FULLY EQUIPPED

SPECIALS

AUTOMATICS

Brown & Sharpe, 00, 0, Cut off, Tur. Form
B. & S., No. 2 Full Auto. No. 2 Tur. Form
⅞" Mod. G Gridley Ser. 8,000 M.D.
1¼" Mod. G Gridley Ser. 10,000 P.D.
1¾" Mod. G Gridley Ser. 7,000 P.D.
2¼", 3¼", 4¼" Gridley Single Spdl. B.D.
1¼" Cleveland Model A 28,000 P.D.
4¼" Model A Cleveland

TURRET LATHES

No. 7 Foster, M.D. Bar Fd. Pwr. Fd. to Turret, 3" cap., rebuilt
No. 2 W. & S. Wire Fd. Frict. B.G.
14"x8' Hendey, Q.C. Taper Attach., M.D.
11"x4' South Bend Q.C., M.D.

MISCELLANEOUS

No. 2A Garvin Univ. Mill, Vert. Hd.
24" Smith—Mills, Tilt Table, Frict.

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24"x12' Pond and Lodge & Shipley
18"x6' American and Bradford
16"x6' Monarch, taper attach.
14"x6' Hendey & Flather

TURRET LATHES

18" Gisholt, taper attach.
No. 6 Warner & Swasey, bar & chuck.
1½" Foster, bar feed
No. 4 & No. 7 Bardons & Oliver

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10"x36" Norton Plain Cylindrical
No. 1½ Cinc. Univ. Tool & Cutter
Ingersoll Cutter Grinder
Wells Twist Drill Grinder
No. 12 Besly D. E. Disc Grinder
Double End Floor Type Grinders

MILLING MACHINES

No. 1½ Cinc. & Brown & Sharpe Plain, cone
No. 3 & No. 3B Brown & Sharpe Plain, geared head and cone drive
No. 2 Knight & No. 6 Becker Vertical Millers
Ingersoll Planer Type Miller
No. 7 Becker Production Miller
No. 3 Garvin Duplex Miller
Garvin & Burke Hand Millers

DRILL PRESSES

No. 14 & No. 16 Natco Mult. Spdl., rec. heads, bored for 22, 24 & 34 spdls., arranged for geared M.D.
Bausch Mult. Spdl., rec. head, 12 spdls.
14", 20", 22" & 24" Barnes, Silver, Superior, National Upright
Single & 4-spdl. Allen H.S. Sensitive
3' American & 4' Bickford Plain Radial
24" Colburn Heavy Duty Drill

PRESSES

50-ton Metalwood Hyd. Forcing
No. 4 Greenerd Floor Type Arbor

MISCELLANEOUS

24" Potter & Johnston Crank Shaper
6"x6" Marvel Power Hack Saw
Rickert Shafer Flexible Radial Tapping Mach.
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Motors, 2 to 40 HP, 3/60/440 volt
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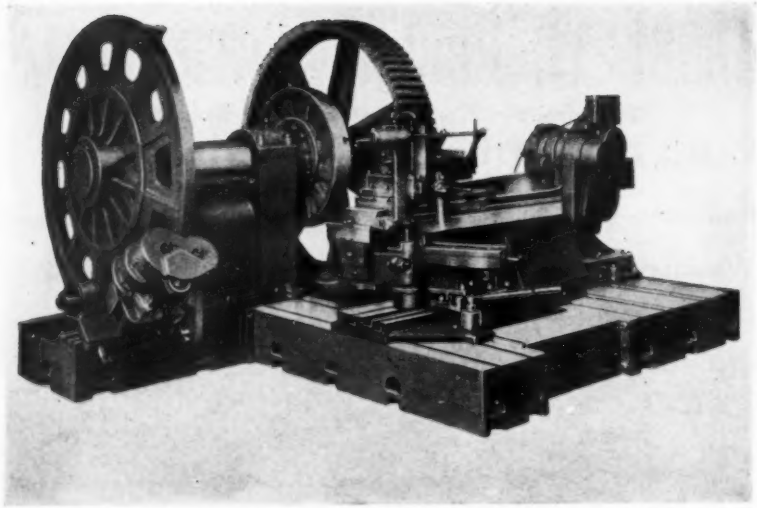

16-ft. Diameter Spur Gear Cutter—"Gleason"

4—Single-Spindle
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"Modern" Threading
Machines—¼" to ¾" capacity

Just one Chance

in a long while do you have of picking up a 16-ft. diam. Spur Gear Cutter—like new—

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GEAR CUTTER, Spur, 16-ft. capacity, GLEASON, for external or internal gears (See illustration)

THREADING MACHINES, "Modern," Cap'ty 1/4" to 3/4" straight thread, and 1/8" to 3/8" pipe thread; Quick change; Max. length thread 7 3/4"; Hole thru spindle 13/16"; 11 available, (4) single spindle and (7) double spindle; Belt or motor driven. (See illustration)

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110" cap'y, NEWTON Spur; Up to 28" face
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500-ton cap'y, UNITED, Hydraulic Forging, with Intensifier, etc.
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BEATTY No. 9, Throat 15"; Cap'y 2 1/4" thru 1 1/8"
BEATTY No. 7, Throat 15"; Cap'y 1 1/4" thru 1"
BEATTY No. 6, Throat 25"; Cap'y 1" thru 1"
SOUTHWARK No. 7, Throat 54"
WILLIAMS & WHITE No. 14; Throat 15"; Cap'y 1 1/4" thru 1"
HILLES & JONES No. 2, Throat 60"; Cap'y 1" thru 3/4"
SOUTHWARK No. 5, Throat 60"; Cap'y 1 1/4" thru 1 1/4"
Horizontal Punch, HILLES & JONES No. 2; 12" throat; Cap'y 1" thru 1"

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4" cap'y, NATIONAL, Heading, Upsetting & Forging
4" cap'y, AJAX, Heading, Upsetting and Forging
2" cap'y, ACME, Heading, Upsetting and Forging
1 1/2" cap'y, ACME, Heading, Upsetting and Forging

HAMMERS
1100-lb. CHAMBERSBURG, Single Frame Steam
250-lb. MAXILLON, Single Frame Steam
200-lb. BRADLEY Helve; Lot of dies
50-lb. LITTLE GIANT, Belted Motor dr.

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90" swing, Driving Wheel Lathe, BEMENT MILES, Double Head
70" swing, Driving Wheel Lathe, BEMENT, Double Head
42" swing, Car Wheel Lathe, NILES BEMENT POND, Center-drive
Banding or Armature Turning Lathe, PEERLESS, 42" swing, 10 1/2' bed, Undercutting att.; Grinding att., etc., Motor-dr.
Engine Lathes, ALL SIZES

MISCELLANEOUS
Accumulator, SOUTHWARK, Hydraulic, 12" diam., 13' high, 1/4" steel vertical ballast tank; Cap'y 130 gal., 1500 lb. pressure; 15" diam. ram, 15' long
Pipe Machine, 2 1/2" to 10" cap'y, STANDARD ENGR., Motor-dr.
Pipe Machine, 1/4" to 2" cap'y, WILLIAMS
Horiz. Borer, 5" diam. bar, BARRETT, Cylinder; Motor-dr.
Crane, 15-ton cap'y, SHAW, 46' span; 5-ton Aux., 110 Volts D.C.
Cold Saw, Cap'y 120" diam., NEWTON, Brand New
Slotter, 24" stroke, DILL, Crank
Slotter, 18" stroke, NEWTON, Crank
Planer, 60" x 30' GRAY, 4 heads; Rev. Motor dr.
Bulldozer, AJAX No. 8; Face of crosshead 18" x 80"; Stroke 24"
Grinder, HEALD No. 60 Cylinder
Grinder, LANDIS No. 24 Crankshaft; Cap'y 18" x 84"
Angle Bending Roll, WILLIAMS & WHITE No. 2; Cap'y 4"x4"x1/2"
Notching Machine, HILLES & JONES No. 6, Cap'y 4"x6 1/2"x1"
Plate Joggler or Scarfing Roll, H&J, Cap'y 3/4" thick, 42" from edge
WOODWORKING MACHINERY, Car Borers, Moulders, Band Resaws, Band Saws; Cut-off Saws; Swing Saws; Mortisers; Timber Sizer; Four-side Planer, Lathes, Trimmers, etc.

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20" Gould & Eberhardt Shaper

24" Stockbridge Shaper, M.D.

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No. 56 National Acme 2¼" capacity 4-spindle Automatic Screw Machine, Serial No. 7018, with large amount of extra equipment.

Excellent operating condition.

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AUTOMATIC SCREW MACHS.
Cleveland, ¾", 1¼" 1¾", 2" & 2¾"; No. 1, 2, 3 Manville

BORING MILLS—VERT.
72", 24" Bullard; 30" and 72" Colburn rapid traverse vert.; 50" Bullard, 2 heads; 42", 52" & 60" Niles

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No. 300 G. & L. 4¾" bar; 12" Niles Cyl. Dble. End 7" Bar Putnam-table type; 3" Lambert; 2¼" Cleveland No. 0 Giddings & Lewis 3"

BRAKES, CHGO. STEEL
Hand—3'16, 4'12, 4'16, 6'16, 8'18, 8'16, 8'14, 10'14
Power Apron Type ——10' ¾"——10' 10 ga.—8'12——6' 10

IRONWORKERS, UNIVERSAL
No. 13 Pels; Oeking 6x6x⅞"
No. 4 Rverson Notching Attach. Smith No. 91-16, notching att.

BOARD DROP HAMMERS
1200 lbs. B.&S.; 800 lb. W.&W. 800 lbs. and 1000 lbs. Bliss

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Geared Head Lathes: 16"x8 Ft., Walcott 20"x12 Ft. 22x44x14 Ft. McCabe Dble. Spindle Bridgeford 26" x 9 ft. and 32"x16 Ft. G.H. 15 speeds 16"x6 ft. Hendey-Yoke Hd. 15" 8 Ft. Sebastian Motor in base 20"x10 & 22x12 Ft L & S; 20x 15' Lehman G. H.
Bradford 26" x 16'; 24" x 12' 25x20' Sidney; 36x14' Springfield; 36x16' S & B; 52x22' Fifield; 18x36x7' Putnam
Am. Grd. Hd. 18x8 No. 9 LeBlond Multi-cut.; 16x8 Bradford; 30x18, L & S 18"x10' Grd. Hd. M.D. 30' Pit Lathe 20x12 Ft. Monarch Gap Lathe

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Grinder — Centerless — No. 2 Cincinnati
Grinder, Surface; No. 16 Blanchard
Grinder—Cyl. No. 25 Landis 12"x144"
Plate Planer — 20 Ft. Niles
Threader, Bolt, 12" Landis, M.D Late type quick acting die head

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UNIV. No. 3 B. & S. No. 4 Cin. No. 2 Kemps.; No. 4 Becker; No. 3-GH Hendey; No. 1½ LeBlond; No. 2 Cleveland; No. 2 Garvin
VERT.—No. 6 & 5-C Becker
PLAIN No. 1 & No. 1½B. No. 2-B & 3-B K & T; No. 3 CIN. B. & S. No. 2-B; No. 4 & No. 5 LeBlond, S.P.D.

PLANERS
10x10x30 Ft. Niles, four heads
36"x48"x12' D. & H. Openside; 20 Ft. Niles Plate Planer
36x36x10 Ft. American
30"x30"x6' Gray
26x8 openside Cincinnati
60x60x18 Ft. Pond
36x36x14 Ft. Detrick & Harvey with side head; 36x36x8 Ft. Niles 36"x16' Cleveland openside

PRESSES, HORN
Bliss Nos. 40, 21, Toledo Nos. 14, 42, 41H, 43B

PRESSES, O.B.I.
Nos. 1, 2, 3, 4, Bliss; No. 5 Michigan
No. 4 B&O—7" stroke; M.D.

PRESSES, Double Crank
Clearing Crankless 4-Point Suspension Type Triple Action Press—All Steel Frame Construction—Self Contained Motor Drive—All Gears Enclosed, 84"x133" bed; Stroke of plunger 28"
Hamilton, No. 6010¼—tie rod 10½" shaft
(1) No. 6-D Bliss 12" strk.; 36"x60" bed Air Cush.
No. 94-G Toledo 8" stroke, 42"x84" bed; Air Cush.
No. 158-B Cleveland 11" shaft; 72" betw. housgs.
No. 4¾ Bliss
No. 154-F Cleveland, 6" shaft—Bed 50"x72"
No. 23—J Bliss Gap Frame —6" str. 4" shaft
No. 206-B Toledo Gap Fr. —6" str. 48" betw.

PRESSES; DOUBLE CRANK TOGGLE
No. 268½-C Toledo, 87" bet. housings bed 60x96"; tie rod; str. of plunger 29" wgt. 200,000 lbs.
No. 409 Bliss; 108" bet. housings; bed 60x108"; tie rod; with air cushions; str. of plunger 31"; wgt. 215,000

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Bliss Nos. 5, No. 4-A—99% new; 1½; Toledo No. 164&165 No. 99 Stoll

PRESSES, Straight Side
No. 56 Bliss Consolidated
No. 4019 Hamilton 800 ton Bliss, No. 78½, 24" stroke No. 73½, No. 74½
Toledo—No. 55, No. 57
No. 65 Consolidated Press
No. 6 Walsh & No. 5 Massillon

RADIAL DRILLS
American 4', 5'; 6' Western & Fosdick; No. 2 Bickford, 5'

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3, 4, 5, 6, 7, 8 Spindle

NEWBOLD PLATE LEVELLER AND STRAIGHTENER
96" wide; 13 rolls and 2 pinch. Motor drive with 75 H.P. A.C. motor

ROLLER LEVELLERS
McKay 60"-66"-48"-54"-72"

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Wickes, Pyramid Type, with mtr., Drop End—18'x1"
10 Ft. Wickes Vert. 1½" cap.
10 Ft. Initial type ¾" capacity 10 Ft. Pyr. type 12" top, 9" bottom rolls; Power Angle 6x6x½

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G. & E. Hi Duty, 28", 24"; 24" American & Queen City

ALLIANCE BENDING ROLLS
1—20 Ft. Long Dia. top roll 24"—lower rolls 18" each—Drop end housing — hydraulically controlled—motor drive —Est. weight 420,000 lbs.

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30' Birdsboro Hydraulic Power Press Brake or Forming Press; Capacity approx. ¾" plate
Ohl—10' 5/16"—10' 14 ga. 8' 10 ga.—New 8L 10 Chgo. Stl.
Ohl 10' 10 ga.; Clearing 10' 1"; No. 255 & 355 Chgo. Stl.; Poorman 10'x10 ga.

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Friction—No. 0, 1, 2, & 4 Ryerson
Hack—6x6 and 9x9 Peerless

SHEARS POWER
16 Ft. Tol. ¼" cap. 15" gap
126" United Eng., 7 ga.
10 Ft. 3/16"
12'14; 6'18; 8'16; 36"x3/16' 5' 10; 8'14; 48"x14 ga.
Alligator No. 1½ Doelger & Kir.
Rotary No. 5 Quickwork ½" cap.
No. 3—3/16" cap. 36" throat

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GRINDER, No. 55 Heald, internal, b. dr.
LATHE, 54"x16' Johnson, motor drive
LATHE, 30"x20' LeBlond, motorized, q.c.
LATHE, 19"x8' Sidney, motorized
LATHE, 18"x10' American, grd. hd., q.c.
LATHE, 12'-18"x6' Seneca Falls, gap, q.c. taper, collets
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HAMMER, 1100 lb. NBP Steam Forging
HAMMER, 2000 lb. Chambersb. Steam Forg.
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PLANER, 72'x60"x15' Betts, 2 hds., mtr.dr.
PLANER, 48"x60"x14' D.&H. Opens., b. d.
MILLER, SD Becker continuous, 40" dia. tbl.
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WHEEL PRESS, 200 ton Caldwell Hydraulic, 48" between bars

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1500 lb. Chambersburg Steam Hammer
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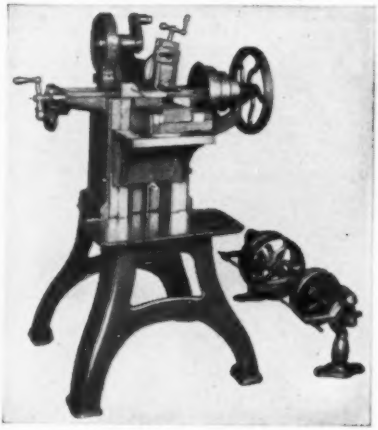

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Traveling Head
Capacity 8"x12"

Can easily be arranged for motor drive.

500 Other Machines In Stock

SAMUEL MACHINERY COMPANY 137 N. Third St., Philadelphia, Pa.

Guaranteed

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NO. 2B HENRI HAUSER JIG BORER, MTR. DRIVE. FULLY EQUIPPED.

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No. 2½ 28" W. F. & J. Barnes Sliding Head.
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24" Hoeffer Sldg. Hd. Tap. Att.
20" Barnes all-grd. self-oiling.
16" Superior, H. S., B. B.
1 & 2 Sp. Demco, H.S. B. B.
2 Spdle. Avey H .S. B. B.
1 & 3 Sp. Allen, P. F. & T. A.
No. 1&2 Leland-G. b., tap Att.
4' Western Mfg. Type, Plain Radial, M. D.

GRINDERS

No. 70 Heald Int., clutch in hd.
Cleveland Relief, M. D.
No. 1 LeBlond Univ. Tool & Cutter, Power Feed.
No. 3 Wil. & Mor. auto., surf.
No. 1 & 3 B&S Univ. Belt Drive.

LATHES

24"x12' Schum. Boye q. c. g.
24"x10' L. & S. Q. C. G., B. G.
16"x12' Hendey Q. C. G., T. A.
14"x10' Hendey Q. C. G., T. A.
9"x4' Seneca Falls, Standard Change Gear, Back Geared.
8"x18" Porter Cable, collets.

LATHES, TURRET

No. 1 Foster Hand.
No. 3 Smurr & Kamen Hand.
10"—2 Spdle. J. & L. Steel Hd., Covered Ways, M. D.

MILLING MACHINES

28" Cinc. Semi-Auto. Dupl. B' D.
40" Gisholt Vert. Bor., arr. MD.
No. 2 P & W Hand.
No. 3 Becker Vertical.
No. 2A Becker Brainard Vert.
No. 1½ Rockford Pl., Vert Hd.
No. 1½ Garvin Universal.
No. 1 Kempsmith Univ., B. G.
6"x48" Pratt & Whitney Thread.
No. 33 Kempsmith Plain, M. D. 13x67" Table
No. 4 Becker Vertical, Back Gr.

PRESSES

Model "B" Rockford 1" Stroke, Floor Legs.
No. 1 Bliss Cam, Fly & Grd.

SHAPERS

25" S&M B.G. Crank, M.D. gr. b.
24" Stock. b. g. crank, M. D.
24" Steptoe B. G. Crank, SPD thru Gear Box.
20" Steptoe b. g. crank.
20" Smith & Mills, b. g.

MISCELLANEOUS

Bolt Cut., 1" Landis Lead Scr.
Die Filer, No. 5 Thiel, m. d.
Gear Cut., No. 3—26"—B. & S.
Riv. Hmrs., Nos. 1AA, 1½B, 2A, H. D., 3A, 3A H. D., & 5A High Speed.
Riv. Spin. ⅜" Linley, M. D.
Saw, 6x6 Peerless Shap., M. D.
Tester, No. 2A Rock'll Hdness.
Welder, 25 K. W. Acme.

George M. Bernstein & Co.

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LATHES

27"x14' Lodge & Shipley
24"x12' Boye & Emmes
20"x10' Boye & Emmes
18"x12' Hendey
16"x8' Lodge & Shipley
15"x6' South Bend

TURRET LATHES

1" Dreses Wire Feed
2 5/16" Foster Wire Feed
20" Swing P. & W. Geared Head

MILLING MACHINES

2—No. 1½ Rockford Plain
No. 1 B. & S. Universal

SHAPERS

16" Cincinnati
20" Steptoe

DRILLS

3' Cincinnati Bickford Rad.
Barnes Hor. Drilling & Boring Machine
Binsee Hor. Drilling & Boring Machine

MISCELLANEOUS

No. 0 Buffalo Angle Bending Roll
15 Ton Lucas Forc. Press

McBRIDE & McCLENNEN *Since 1919*

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148 N. Third St., Philadelphia, Pa.

MOSER'S HIGH GRADE TOOLS

No. 3-B K.&T. Plain Milling Machine
No. 2-B Foster Univ. Turret Lathe, chuck work, M.D.
No. 3-A W.&S. Turret Lathe, chuck work
2-¼"x24" J. & L. Turret Lathe
No. 2 Foster Screw Mch., A. C. & B. F.
No. 3 Brown & Sharpe Universal Grinder
3" Oliver Drill Grinder, motor in base
Oliver Arc Face Mill Grinder, 24" cap.
12"x6' American Q.C.G. Lathe, D.B.G., collets, chucks, taper attachment
14'x8' Davis Q.C.G. Lathe, ctrshaft M.D.
16"x6' Reed P.C.G. Lathe
20'x12' Hendey Q.C.G. Lathe, taper att., pan bed, M.D.
Pratt & Whitney Hand Miller
No. 3 Adams Gear Hobber
2—No. 2 Avey Single Spindle Drills
No. 2 Leland-Gifford Single Spindle Drill
No. 2-A High Speed Riveter, M.D.
No. 130 Pexto Foot Operated Squaring Shear
No. 24 New Britain 5-Station Automatic with chucks, B.D.
32—Spindle Natco Drill
National Oil Separator, 2 bu., M.D.

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HOBBERS & GENER'S.
6" & 11" Gleason bevel gear
26" Rhenania & No. 3 Adams

GRINDERS
No. 3 Cin. 12x48, cyl.
Nos. 4, 6, 7 Gardner and Badger, Disc.
8" Heald Rotary Surface

LATHES
3½x60 Fitchb.; Lo-Sw. S.P.D.
9x20 Porter-Cable-Prod.
14x6 Flather Q.C.G. Tap. Att.
24x8 Sch-Boye, Q.C.G. T.A.
27x16' Bridgeford—S.P.D.

MILLING MACHINES
No. 2 K. & T. Plain. Cone
No. 3 Cincinnati, Univ., C.
No. 3B K & T Plain; S.P.D.

SHAPERS
24" Walcott, Helical Gear
24" Ohio, B.G. Single P.D.

SCREW MACHINES
No. 4 Millholland, Bor Fd.
No. 9 Foster—3¼" Bar Cap.
2A W. & S., Cone Dr.

MISCELLANEOUS
Metal Saw: No. 8 Marvel
Boring Mill, 3" Horizontal
4" Bar. Niles, Table Type
5" Bar. Beaman-Smith, Hor.
Broaches: V18 Amer. 1 & 2 Spindle LaPointe
Drills: 4 Spindle Adjustable Rail Type: 14 sp. Pratt & Whitney Multiple
Radial Drills: 3' Bickford
No. 6 Wells wire st. & cut.

PARTIAL LIST. SEND US YOUR INQUIRIES.

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NEW 3 Phase B. B. Motors ½ to 25 H. P., 5 H. P. $55.75

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20" Lever, Wheel & Lever and Power Feed.
24" and 28" sliding head, back gear, power feed.
Bausch Multiple 16 spindle No. 1 Morse Taper.
4 spindle Foote-Burt, heavy duty.
6 spindle Hole Hog No. 1 Morse Taper, power fd.
1, 2 and 4 spindle high speed 8" overhang.
5' Bausch Radial Drill.
59 other drills of various sizes and types.

MISCELLANEOUS
Brake, Robinson, toggle, 5'.
Brakes, 6' and 10' for 18 gauge.
Grinders, cutter and cylindrical, plain and univ.
Grinders, Bryant deep hole chucking.
Broaching Machines, No. 1 and No. 3 LaPointe.
Lathes, 20"x10' Bradford, 3 step, db. bk. gr.
Lathe, 28"x20'. 6" Rahn Carpenter, with rais. blocks.
Milling Machine, No. 4 Burke.
Milling Machine, 20"x20"x8' Ingersoll Slab, m. d.
National Acme Automatics Nos. 52, 53 and 55.
Planer, 24"x24"x5' Hamilton.
Shaper, 24" G & E, back geared crank.
Turret Lathe, No. 4 Bardons & Oliver, chuck, equip.
Turret Lathe, 2¼" J. & L., cross slide head.
MOTORS, REBUILT 3 Phase ½ to 50 HP various speeds.

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No. 3 Univ. D&K, Tool, Cut.
No. 2 Reid, automatic, surf.

LATHES
15x6 Rockf., S.C.G.
15x6 LeBlond, Q.C.G., T.A.
15x6 Sidney, Q.C.G.
18x6 Rahn Larmon, Q.C.G., M.D.
14x6 Hendey, collets
16x7 Sidney, Q.C.G.
16x6 Hendey, Q.C.G.
16x9 American, Q.C.G.
17x9 Sidney, Q.C.G.
20x10 Walcott, Q.C.G.
22x11 Cisco, Q.C.G.

MILLING MACHINES
No. 0 Stark, prec. type
(2) Chicago, Hand
No. 1 Rockf. vert. hd.
No. 1 Steptoe
No. 1 Kemp., univ. compl.
No. 20 Ohio
No. 25 Ohio, univ., compl.
No. 1½B K & T, S.P.D.
No. 1B K & T Univ., S.P.D. M.D.

MISCELLANEOUS
Screw Machine, No. 4 Mil.
Presses, 0's to 3's
Shapers, 12" to 24"
Shears, 5' Bertsch, gap, overhead drive; 10' Ohl
Keyseater, No. 2 Baker
Broach, No. 2 La Pointe
Bolt Threader, 1½" Landis triple head

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AUTOMATIC SCREW MACHINES

5—Four Spindle Model M. Cleveland Automatic Screw Machines Arranged for Motor Drive

1—Six Spindle No. 654 New Britain Automatic Chucker, Motor Drive, Air Chucks

1—J. & L. 3"x36" Turret Lathe, S.P.D.

1—J. & L. 2¼"x24' Turret Lathe, S.P.D.

1—Single Spindle 3¼" Gridley, M. D., Automatic

1—Single Spindle 1½" Model B. Cleveland Automatic

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117 FOURTH STREET
PITTSFIELD, MASS.

MACHINE TOOLS FOR SALE

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1—14"x6' cone drive motorized with Cullman Driven MONARCH ENGINE LATHE, q.c.g.
1—28"x12' SCHUMACHER & BOYE LATHE, c.d. double back geared, q.c.g.
1—36"x16' SCHUMACHER & BOYE LATHE, c.d. double back geared, q.c.g.

TURRET LATHES

3—26" Model C LIBBY TURRET LATHES, s.p.d., all geared feeds and speeds, 7½" hole through spindle
1—No. 2A WARNER & SWASEY UNIVERSAL TURRET LATHE, s.p.d., all geared head, serial 141,743, arranged for chucking work, hole through spindle 2¾"
1—No. 3 FOSTER TURRET LATHE, c.d., back geared, motorized with Western Drive, bar capacity 1 5/16"
1—2¼"x24" JONES & LAMSON FLAT TURRET LATHE, s.p.d., all geared head, equipped for bar work
1—1½"x9" Cincinnati Acme Screw Machine, friction screw head, c.d., motorized with Cullman Drive, equipped for bar work, chuck capacity 1½"
1—2¼"x11" Cincinnati Acme Screw Machine, friction screw head, c.d., motorized with Cullman Drive, equipped for bar work, chuck capacity 2¼"
1—24" Steinle Turret Lathe, s.p.d., all geared head, 6¼" through spindle

BORING MILLS

1—24" Bullard Vertical Turret Lathe, s.p.d. through gear box, with turret head on cross rail and with side head

GRINDERS

1—No. 14 BROWN & SHARPE CYLINDRICAL GRINDER, belt drive, 10" swing, 18" grinding length
1—No. 1 Brown & Sharpe Universal Grinder, arranged for 3 motor drive
1—No. 205 Rivett Internal and Radial Grinder
1—No. 2 Oliver Instrument Arc Face Mill Grinder

MISCELLANEOUS

1—18" Gould & Eberhardt gear hobber, for spur, helical and spiral gears
1—20" Rockford Shaper s.p.d. through gear box
1—6' Bickford plain radial drill, s.p.d. through gear box, dia. of column 15"
1—No. CS Becker Continuous vertical miller with 29¾" rotary table

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Peoples Bank Bldg., Cincinnati, O.

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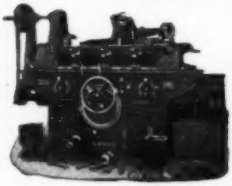

SURFACE GRINDERS

1—No. 16 Blanchard
3—14" Model "B" Pratt & Whitney Vert.
1—14" Pratt & Whitney Vert.
1—No. 200 Heald Rotary
1—No. 255 Heald Rotary
1—No. 25 Heald Rotary
1—8" Person-Arter Rotary
1—Model "H" Diamond Hyd., 16"x 12"x72"
1—No. 5 Diamond
1—No. 6 Diamond
1—Osterholm Horizontal
1—84" Safety Face
1—156" Knife Grinder
1—74-50 Bridgeport H.D. Knife
1—No. 96 30" Gardner Face
3—84" Diamond Face

INTERNAL GRINDERS

1—No. 10 Bryant
2—No. 18 Bryant
3—No. 6 Semi-Automatic Bryant
2—No. 55 Heald
1—No. 60 Heald
1—No. 65 Heald
1—No. 70 Heald
1—No. 72 Heald
1—Churchill-Morgan
1—No. 23 Baxter & Whitney

PLAIN CYLINDRICAL GRINDERS

2—6"x32" Norton
1—6"x18" Landis
2—8"x18" Cincinnati
1—10"x36" Landis, camshaft
7—10"x24" Landis
2—10"x36" Norton
2—10"x48" Norton, Model A
2—10"x36" Norton, cam
1—14"x48" Norton, Type A
1—16"x32" Landis, crank pin

PLAIN CYLINDRICAL GRINDERS (Cont.)

1—16"x42" Landis, Hyd. pin
1—16"x68" Landis, crank pin
1—24"x96" Landis
5—No. 132 Arter Automatic

UNIVERSAL CYLINDRICAL GRINDERS

1—No. 2 Bath
1—10"x36" self cont. Thompson
1—12"x24" Cincinnati
1—12"x36" N.B.P.
1—24"x144" Landis

DISC GRINDERS

3—No. 2 Gardner D. E.
1—No. 1 Gardner D. E.
1—No. 6 Gardner D. E.
3—No. 41-20" Besly D. E.
1—No. 84-16" Gardner D. E.
1—No. 26 Besly D. E.
1—No. 6 Besly D. E.
1—No. 50 Gardner S. E.
1—No. 51 Besly D. E.
1—No. 8 Badger S. E.
1—No. 6 Diamond D. E.
2—No. 8DA Hisey Wolf D. E.
1—12" Gorton 6C S. E.
1—No. 14 Gardner Opposed
1—No. 27 Gardner Opposed
1—No. 84-A Gardner Opposed
1—No. 123 Gardner Opposed
1—36" Discs—Standard Opposed

MISCELLANEOUS GRINDERS

2—LaPointe Broach
2—12-Spindle Defiance Valve
1—Type 3 2-spindle Cock
1—36" Ingersoll Tub Type
2—24" Ingersoll Tub Type
2—Gisholt Tub Type
1—Grand Rapids Tap

All machines are available for inspection in our Chicago stock.

LOUIS E. EMERMAN & CO.

1761 ELSTON AVE., CHICAGO, ILL.

Index To Advertisers

A

Aaron Machinery Co. 247
Abart Gear and Machine Co. 204
Abrasive Dressing Tool Co. 105
Acme Equipment Company 266
Acme Industrial Co. 203
Acromark Corp. 172
Aircraft Mchy. Corp. 190
Air-Way Pump & Equipment Co. 163
Albert & Son, L. 128
Alco Tool Company 129
Alphil Spot Welding Co. 239
American Broach & Machine Co. 61
Anderson Bros. Mfg. Co. 169
Annis Co., R. B. 134
Armglo Company 192
Armstrong-Blum Mfg. Co. Inside Front Cover
Armstrong Bray & Co. 206
Armstrong Bros. Tool Co. 4
Atlantic Mchy. Corp. 119-267
Atlas Press Co. 131
Auto Moulding & Mfg. Co. 215
Avey Drilling Machine Co. 41

B

Baldor Electric Co. 175-241
Banner Manufacturing Co. 208
Bansbach Machinery Corp. 256
Bauer Machinery Co. 252
Baumbach Mfg. Co., E. A. 190
Beatty Mch. & Mfg. Co. 25
Bennett-Rafkin Machine Tool Corp. 257
Berkeley Equipment Co. 15
Bernstein & Co., Geo. M. 285
Beverly Shear Co. 235
Black Diamond Saw & Mch. Works 193
Blaner Co., John 170
Blank & Buxton Machinery Co. 18
Bleser Mfg. & Machine Co. 252
Boughter, William 222
Bradley Machinery Co. 260
Bremil Mfg. Co. 140
Breuer Electric Company 221
Brewster-Squires Company 230
Bridgeport Machines, Inc. 6
Brighton Screw & Mfg. Co. 282
Brooks Co., B. D. 252
Brown & Sharpe Mfg. Co. 51-171
Brown-Brockmeyer Co. 101
Brown Machinery Co. 262
Bryant Chucking Grinder Co. 19
Buffalo Forge Co. 79
Burgess Battery Co. 218
Burke Machine Tool Co. 60
Burns Mchy. Co., F. W. 266
Burr & Son, J. T. 228

C

Canedy-Otto Mfg. Co. 24
Capewell Mfg. Co. 211
Carboloy Co., Inc. 212
Carroll Mfg. Co., L. W. 188
Challenge Machy. Co. 115
Chicago Tool & Engineering Co. 235
Chicago Wheel & Mfg. Co. 146-147
Cincinnati Electrical Tool Co. 292
Cincinnati Machinery & Supply Co. 277
Cincinnati Tool Co. 207
Cone Automatic Machine Co. 116
Continental Machines, Inc. 107
Conway Clutch Co. 141
Cotter-Thermo Electric Co. 253
Criterion Machine Works 186
Cullman Wheel Co. Back Cover
Cushman Chuck Co. 83

D

Daley & Sibley Mchy. Dealers 268
Daniels, C. R. 252
Danly Machine Specialties 20
Davis Mchy. Co. 247
Dayton, Marvin & Bakewell 157
Dearborn, J. W. 220
Delta Equipment Co. 285
Delta Manufacturing Co. 109
Desmond-Stephan Mfg. Co. 217
Detroit Power Screwdriver Co. 108
Detroit Stamping Co. 86
DeWitt Tool Company 278
DoAll Company, Inc. 195
Dony Machinery Co., D. E. 248
Douglas Machinery Co. 236
Dreis & Krump Mfg. Co. 21
Dremel Manufacturing Co. 130
Drive-All Mfg. Co. 148
Dumore Co. 85
Duro Metal Products Co. 123
Dyer Welder & Eng. Co. 14

E

Eastern Machinery Co. 272-273
Economy Machine Products Co. 226
Eisler Engineering Co., Inc. 104
Ekstrom, Carlson & Co. 202
Elastic Stop Nut Corp. 206
Electro-Matic Products Co. 196
Elgin Tool Works 121
Elmes Engineering Co., Chas. F. 89
Elyria Belting & Machinery Co. 252
Emerman, & Co., Louis E. 288
Empire Tool Co. 163
Errington Mechanical Laboratory 187
Ertel Machine Co. 203
Esco Engineering Corp. 22
Esenwine, H. A. 178
Essley Machinery Co., E. L. 274
Etco Tool Co. 10
Ex-Cell-O Corp. 49
Excelsior Tool & Machine Co. 176

F

Factory & Mill Supply Co., Inc. 253
Failor-Strafer Machinery Co. 248
Falk Mchy. Co. 265
Famco Machine Co. 207
Federal Foundry Supply Co. 221
Federal Press Co. 210
Federal Products Corp. 165
Fell Co., Wm. B. 126
Feltere Company 53
Field Co., Wm. H. 253
Ford Motor Co. 69
Foredom Electric Co. 224
Foster Machinery Co. 250
Fray Machine Tool Co. 94
Frye Mchy. Sales Co. 274
Fuchs Machinery & Supply Co. 250
Fulflo Specialties Co. 26

G

Galland-Henning Mfg. Co. 91
Galbreath Mchy. Co. 250
Gallmeyer & Livingston Co. 6
Gamey Mchy. Co. 282
Gaston Power Tools Co. 218
General Blower Co. 260
General Machinery Corp. 159
George Mchy. Co., James W. 253
Gilmore & Co., F. F. 92
Gilmore Mchy. Co. 286
Gits Brothers Mfg. Co. 177
Given Machinery Co. 54
Goldman & Co., Harvey 275
Gorton Machine Co., Geo. 93
Grant Mfg. & Machine Co. 130
Greaves Machine Tool Co. 179
Greenerd Arbor Press Co. 191
Grobet File Corporation of Am. 166-167
Guardian Utilities Co. 193

H

Hack Machine Co. 64-65
Hajoca Brass Works 253
Halco Products Co. 139
Hamilton Tool Co., The 206-208
Hammond Machinery Builders 71
Hannifin Mfg. Co. 37
Hardinge Brothers, Inc. 3
Hart Machine Co 126
Hartford Special Machinery Co. 174
Harvey Mfg. Corp. 220
Haskins Company, R. G. 73
Heimann Mfg. Co. 209
Heuser Manufacturing Co. 124
Hill-Clarke Machinery Co. 259-266
Hobart Brothers Co. 1
Hotel Lafayette 204
Houghton & Co., E. F. 189
Hyman & Sons, Joseph 250

I

Ideal Commutator Dresser Co. 198
Illinois Testing Laboratories, Inc. 224
Indianapolis Machinery & Supply Co. 261
Industrial Plants Corp. 279
Inland Machinery Co. 282
Interior Steel Equipment Co. 185
Interstate Machinery Co. 283
Iroquois Machinery Co. 268

J

Jackson Machine & Tool Co. 158
Jarvis Co., Chas. L. 57
Jefferson Mach. Tool Co. 242
Jessop Steel Co. 173
Johnson & Sons Machinery Co., Wm. C. 248-253
Jones and Lamson Machine Co. 7
Jones Machine Tool Co. 250

K

K-O Products Co. 106
Kalamazoo Tank & Silo Co. 127
Kamis Engr. Co. 284
Karelsen, Inc., F. 156
Kearney & Trecker Corp. 47
Kluber Machinery Co., E. L. 248
Knowles Foundry & Mch. Co. 256
Knu-Vise, Inc. 231
Knebel Diamond Tool Co. 184

L

L-W Chuck Co. 145
L. & J. Press Corp. 184
Lafayette Machinery Corp. 254
Lagonita Lodge 160
Lake Machinery Co. 254
Lang Machinery Co. 249-250
Laurens Bros. 287
Lee Co., K. O. 78
Leslie Welding Co. 197
Lewis Machine Tool Co. 114
Libert Machine Co. 162
Lima Electric Motor Co. 225
Linderme Machine & Tool Co. 128
Linley Brothers 174
Lipe, Inc., W. C. Inside Back Cover
Littell Machine Co., F. J. 230
Lloyd Machinery, Inc. 247
Logan Engineering Co. 199
Luma Electric Equipment Co. 122

M

McCabe & Sheeran Mchy. Corp. 280-281
McDonald Machinery Co. 263
McKenna Metals Co. 161
McMahon Co., Frank M. 58
Machinery Mfg. Co. 199
Madison-Kipp Corp. 246
Mall Tool Company 111
Marshalltown Mfg. Co. 133
Michigan Chrome & Chemical Co. 172
Midwest Tool & Eng. Co. 167
Miles Machinery Co. 269
Milliken Machine Co. 186
Modern Machine Corp. 214
Modern Tools, Inc. 175
Mohr Lino-Saw Co. 204
Morey Machinery Co., Inc. 124-134-157-274
Morris Machinery & Co., Inc. 256
Morton Salt Co. 97
Moser Machine Tool Sales 286
Mutual Engineering Co. 176

N

National Acme Co. 45
National Machine & Tool Co. 252
Nelson Machinery Co. 248
New Britain Tool & Mfg Co. 192
New Method Steel Stamps, Inc. 112
Nicholson & Co., W. H. 203
Nicholson File Co. 39
Nielsen, Inc., 224
Nielsen Tool & Die Co. 56
Nilson Machine Co., A. H. 182-183
Norgren Co., C. A. 181
Norton Company 9
Numberall Stamp & Tool Co. 164
Nutmeg State Mchy. Corp. 251

O

O'Brien Machinery Co. 284
Oliver Instrument Co. 233
Oliver Motorcraft Corp. 92-252
O'Neil-Irwin Manufacturing Co. 122
Osborne & Sexton Machinery Co. 286
Ott Machinery Sales, Inc. 264

P

Pacific Hydraulic Press & Tool Co. 234
Plunket Machine Co., J. E. 223
Postel Filing Mch. Co. 208
Pratt & Whitney 59
Precision Tool Co. 226
Preis Engrav. Mch. Co., H. P. 96
Printz Electric Co. 168
Procunier Safety Chuck Co. 27
Production Machine Co. 187
Progressive Tool & Cutter Co. 164
Prosser & Son, Thomas 233
Putnam Tool Co. 229
Pyrometer Instrument Co. 213

Q

Quality Hardware & Machine Corp. 159
Quality Tool & Die Co. 164

R

R & L Tools 113
Racine Screw Works 132
Racine Tool & Mch. Co. 102
Reed-Prentice Corp. 43
Reeve-Fritts Co. 251
Regar Mchy. & Mill Supply, S. M. 248-253
Reich Manufacturing Co., J. R. 54
Reliance Machinery Sales Co. 247
Remco Products Corp. 214
Richards Co., J. A. 215
Rigid Tool Co. 144
Ritterbush & Co. 255
Rivett Lathe & Grinder, Inc. 2
Rogers & Co., Saml. C. 239
Ross Co., David J. 90
Rotary File Co. 214
Rotor Tool Co. 17
Russell Boring Bar Co. 189
Russell Machine Co. 252
Ruthman Machinery Co. 114
Ryerson & Son, Inc., Jos. T. 32

S

S. & S. Machinery Co. 258
S & S Machine Works 200
Salem Tool Co. 238
Samuel Mchy. Co. 284
Schauer Machine Co. 168
Scherr Co., George 186-219
Scott Machinery Sales 278
Segal Machinery Co. 286
Sellers & Co., Wm. 197
Sellstrom Mfg. Co. 234
Seneca Falls Machine Co. 227
Severance Tool Mfg. Co. 62
Sheldon Machine Co. 169
Siegman Machinery Co. 247
Simmons Machine Tool Corp. 77-262
Simonds Saw & Steel Co. 245
Skilsaw, Inc. 28
Smith Power Transmission Co. 125
South Bend Lathe Works 30
Specialties Mfg. Co. 200
Speedway Manufacturing Co. 199
Stackbin Corporation 151
Standard Electrical Tool Co. 110
Standard Machinery Co. 251
Standard Pressed Steel Co. 151
Stanley Works 135
Star Machine & Engineering Corp. 136
Stark Tool Co. 96
State Machinery Co. 251
Steege Machinery Co., W. L. 194
Stokerunit Corp. 154
Strand Co., N. A. 217
Strong, Carlisle & Hammond Co. 264
Stuart Oil Company, D. A. 66
Sturdimatic Tool Co. 185
Sturtevant Co., P. A. 179
Sun Machinery Co. 276
Sun Oil Co. 80
Sundstrand Machine Tool Co. 87
Sunnen Products Co. 75
Superior Tool Co. 208
Sutton Tool Co. 118

T

Tannewitz Works 193
Taylor Machine Co. 220
Thames Metal Works 170
Thompson & Son Co., Henry G. 142
Toledo Timer Co. 60
Topeka Foundry & Iron Works 188
Torq Electric Mfg. Co. 11
Travers Tool Co. 282
Trico Fuse Mfg. Co. 246
Triplex Machine Co. 287
Trojan Steel Co. 248
Troyke, Alfred A. 222
Turner Uni-Drive Co. 95

U

U. S. Tool Co. 98
Universal Engineering Co. 58-216
Universal High Speed Tool Co. 201
Used and Rebuilt Machinery 247-288

V

Van Norman Machine Tool Co. 53
Verson Allsteel Press Co. ..... Front Cover
Victor Machinery Co. 268
Victor Machinery Exchange 270-271
Viking Tool & Machine Corp. 56
Vine, R. A. 258
Vonnegut Moulder Corporation 142

W

Wade Instrument Co. 213
Walker-Turner Manufacturing Co. 16
Wall-Colmonoy Corp. 205
Walls Sales Corporation 232
Waltham Dial Gage Co. 88
Walton Co. 194
Ward Foundries, Inc., J. P. 248
Wardwell Mfg. Co. 226
Wayne Chemical Products Co. 236
Webb Machinery Co., O. T. 252
Weldex, Inc. 180
Wells Manufacturing Corp. 23
Western Tool & Mfg. Co. 230
Western Tool Exchange 253
Westlof Tool & Die Co. 153
West Penn Machinery Co. 251
White Dental Mfg. Co., S. S. 55
White Machinery Co., A. D. 276
Whitney Mfg. Co., W. A. 120
Whitney Metal Tool Co. 190
Wigglesworth Mch., T. R. 252
Wiener Machinery Co. 252
Willeys Carbide Tool Co. 153
Wilson, K. R. 13
Winter Bros. 191
Wittek Manufacturing Co. 12
Wright, Inc., L. G. 209

Y

Yost Mfg. Co. 96

Z

Zeeve, Alex 252
Zeh & Hahnemann Co. 191

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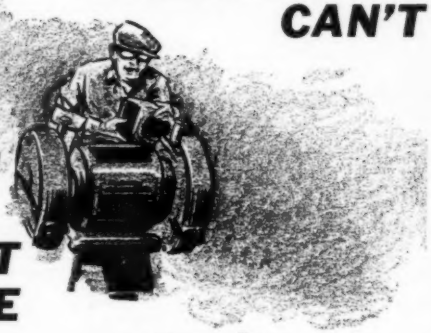

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The Cincinnati Electrical Tool Co.

DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

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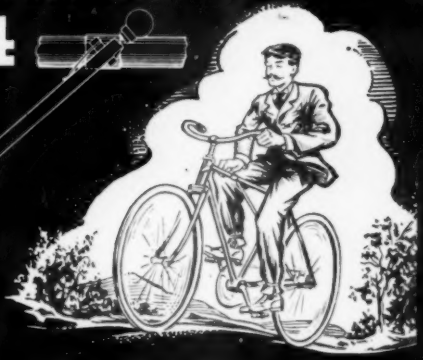

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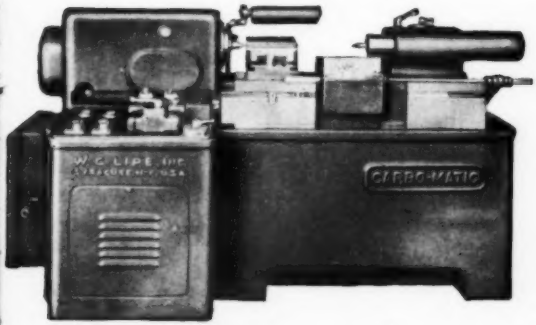
Today the LIPE *fully automatic* CARBO-MATIC LATHE!

Here's the last word in a machine tool for today's rapid-fire production of multiple parts. A tool so powerful and so rigid that it takes deeper cuts through the toughest modern alloys with amazing speed and precision. A lathe that turns accurately to tolerance commonly used for rough grinding. With no out of round . . . no out of true . . . and worthwhile reduction in tool wear and breakage.



More—it is entirely automatic throughout a complex cycle of operations. You simply load and push the lever: The spindle starts, the tools advance . . . tool relief is carried out . . . the carriage returns to the load position and the entire mechanism automatically stops, ready for reloading.

Hydraulic control governs spindle clutch, the chuck and collet closer, the longitudinal and cross feeds and the tailstock quill. 8" swing over carriage, 30" between centers. Investigate now. Write or wire for new, illustrated folder.

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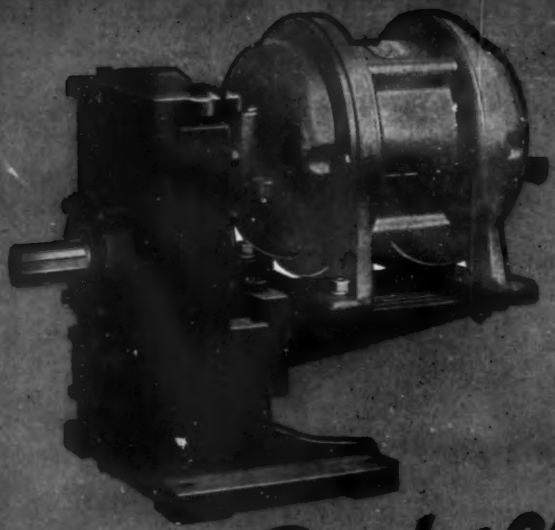

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ANY MOTOR can be used with the Cullman Speed Reducer. Motor mounting has a universal adjustment which permits application of any make of motor and simplifies installation.

CULLMAN REDUCERS are made in Single, Double and Quadruple Reduction Types, in sizes for motors from ⅛ to 15 h. p.

The driver mechanism is simple and sturdy, comprising roller chain and sprockets, Timken roller bearings and helical gears, all operating in oil, in an oil and dust-proof case.

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